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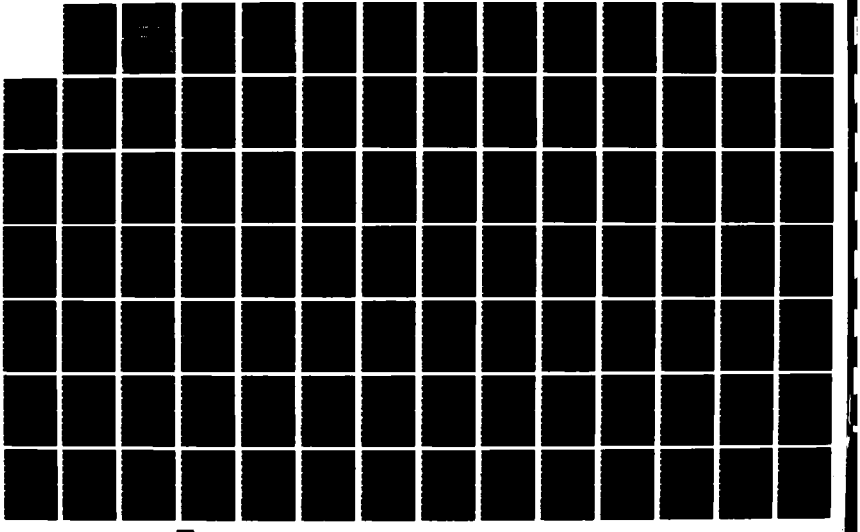

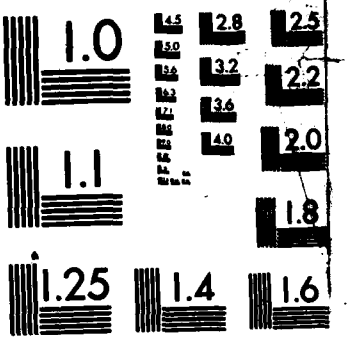

DEPARTMENTS OF

PATHOLOGY AND AREA LABORATORY SERVICES

AND

RADIOLOGY

SUBMISSION

MANUAL

JUNE 1985 EDITION

WALTER REED ARMY MEDICAL CENTER

WASHINGTON, D.C. 20307-5001

ACKNOWLEDGEMENTS

In addition to the contributions made to this manual by the staffs of the Departments of Pathology and Area Laboratory and the Department of Radiology, special appreciation is extended to Linda Baylor, who assembled and prepared the manuscript.

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INTRODUCTION

This manual has been prepared in order to assist the medical staff in the efficient utilization of the laboratory and diagnostic facilities provided by the Department of Pathology and Area Laboratory Services, and the Department of Radiology. It contains pertinent information about procedures presently performed in the various laboratories, normal ranges for the various determinations, and other operational procedures of the departments. Changes to this handbook will be published and distributed in the form of revised pages as the need arises; in addition, when changes are published a notice will be published in appropriate media. Routine distribution will be accomplished through professional departments for staff members and through Medical Education for interns and residents. Close adherence to the information and instructions contained herein will assure more effective laboratory support and services for the benefit of the Walter Reed Army Medical Center health care community.

See p 3

Lewis A. Mologne

LEWIS A. MOLOGNE, M.D.
Major General, MC
Commanding

DEPARTMENT OF PATHOLOGY AND AREA LABORATORY SERVICES

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GENERAL INFORMATION

1. ORGANIZATION: The Department of Pathology and Area Laboratory Services is divided into four services (reference WRAMC Regulation 10-1).

a. Anatomic Pathology Service: Includes histopathology, cytopathology, electron microscopy and the morgue.

b. Clinical Pathology Service: Includes hematology and urinalysis (clinical microscopy), microbiology, clinical chemistry, diagnostic immunology, and blood bank (immunohematology).

c. Veterinary Laboratory Service.

d. Forensic Toxicology Drug Testing Laboratory.

2. LOCATION OF THE LABORATORY

a. Anatomic Pathology Service: The cytology and histology laboratories are located on the second floor of Building T-2.

b. Clinical Pathology Service: The routine laboratories of Clinical Pathology Service are located on the second floor of Building 2; the Acute Care Laboratory is located on the fourth floor. Additional facilities are housed at Fort Meade, Maryland.

c. Veterinary Laboratory Service: The Veterinary Laboratory Service is located at Fort Meade, Maryland.

d. Forensic Toxicology Drug Testing Laboratory: The Forensic Toxicology Drug Testing Laboratory is located at Fort Meade, Maryland.

3. LABORATORY HOURS AND STAFFING

a. The laboratory operates seven days per week, twenty-four hours per day.

b. Regular duty hours with full staff are Monday through Friday, 0745-1630 hours.

c. On weekends, holidays and after regular duty hours, the laboratory operates with a reduced staff. Only emergency procedures are performed.

d. In most instances, specimens will be accepted on weekends, holidays and after duty hours for tests that cannot be deferred until regular hours. If in doubt, consult laboratory personnel or the pathologist on-call.

e. Outpatient and ambulatory inpatients are accepted for phlebotomy from 0630 to 1700 hours, Monday through Friday. Personnel are not available for phlebotomy on weekends or holidays. Physicians and ward personnel are

encouraged to refer all outpatients, and ambulatory and stable ward patients during regular duty hours to the laboratory for phlebotomy.

f. Morning Bleeding Rounds: The laboratory provides morning venipuncture ward rounds for non-ambulatory patients.

(1) Morning rounds begin at 0600-0630 hours.

(2) All lab slips for the morning rounds should be in the laboratory by 0500 hours. Slips must contain complete patient identification data (name, FMP-SSN), the ward number, the patient's bed and room number, physician's identification, test requested and time of collection; and, must be accompanied by one pre-stamped label for each requisition, and one extra pre-stamped label per patient.

(3) The members of the bleeding teams have been instructed not to accept additional slips while on morning rounds and to attempt drawing a patient no more than twice. Bleeding team personnel are only required to draw from anticubital fossae venis. Other sites are to be drawn by patient care personnel on the ward or in the clinic. Care must be taken to ensure that venipuncture blood collections are not made from limbs that have IV lines in place.

(4) Members of the bleeding team will draw patients in isolation if gloves and gown are not required. All patients in isolation and/or on hepatitis precautions must have this information written on the laboratory requisition slip.

(5) Lab slips for patients not drawn because of difficulty in obtaining the sample and/or patients not present on the ward for drawing will be turned in to the nurses' station. Laboratory personnel cannot wait for patients to return to the ward.

(6) Complaints, problems and other difficulties encountered by ward personnel regarding morning ward rounds should be addressed directly to the NCOIC, Specimen Procurement Section (576-1914), and NOT to individual members of the bleeding team. Many of these individuals are volunteers and the department would be unable to provide this service without their help.

4. LABORATORY REQUESTS

All laboratory requisitions must be completely labeled with the patient's name, FMP-SSN, physician's name and identification number, date, time of collection, test(s) requested, and the place for returning results (i.e., ward, clinic, etc.). In addition, all specimens must be labeled with the patient's name and FMP-SSN. Incomplete requisitions and incompletely labeled specimens will not be processed and will be discarded in the laboratory without notification to the ward or clinic. Under no circumstances are laboratory personnel permitted to prepare or complete laboratory requisitions or label specimens.

5. REQUEST CATEGORIES

a. Acute Care Lab: This category is reserved for medical emergencies and is given top priority. Results will entered into the TRILAB computer system as soon as verified or be telephone. Turnaround time is approximately one hour. See Table I, Emergency Procedures Section.

b. Priority Lab: This category is reserved for tests needed on a rapid, but non-emergency basis. Results will be available approximately four hours from time of specimen receipt in the Department of Pathology. See Tables II, III, and IV, Emergency Procedures Section.

c. Routine Requests: This category should represent the majority of Pathology workload. These requests will usually have results available the same day depending on procedures requested and time of receipt.

6. REPORTING OF RESULTS

a. The majority of clinical laboratory results are reported by way of the TRILAB computer terminals (CRTs or printers) at various locations throughout the Center.

b. Computer printouts of routine laboratory test results are placed by ward and clinic into a distribution box located in the clinical laboratory. Results will be returned via telelift if a cart is sent from the requesting department to Station 143.

c. Acute Care Lab results are entered into the TRILAB computer system and can be telephonically reported if requested. The completed requisitions are subsequently placed in the ward and clinic distribution box in the laboratory.

TELEPHONE DIRECTORY

DEPARTMENT OF PATHOLOGY AND AREA LABORATORY SERVICES, WRAMC

	AUTOVON	COMMERCIAL
Fort Meade, Maryland	923	677
WRAMC	291	576

OFFICE OF THE CHIEF	EXT
Chief	1280
Chief's Secretary	1280
Sergeant Major	1284
Administrative Officer	1295
Administrative Office (Ft Meade)	2789
Operations Officer	1089
NCOIC, Specimen Procurement	1915
Reception Desk	1914
Logistics Support Section	2525
Logistics Support Section (Ft Meade)	2754
Education and Training Section	1210

CLINICAL PATHOLOGY	
Chief	1046
Chief Resident, Clinical Pathology	1079
Chief's Secretary	1046
NCOIC	1077
Acute Care Laboratory	3889
Emergency Procedures Section	1913
Blood Bank Section	
Chief	1989
Immunohematology	1990
Transfusion Service	1989
Medical Director	1989
Donor Center	3372
Chemistry Section (Ft Meade)	4090
Chemistry Section (WRAMC)	
Chief	1926
Laboratory	1925
Medical Director	1927
Clinical Microscopy Section (Hematology)	
Medical Director (Hematopathology)	1902
Laboratory	1043
Urinalysis	1918
Diagnostic Immunology Section	
Medical Director	1265
Laboratory	1265
Microbiology Section (Ft Meade)	2908
Microbiology Section (WRAMC)	
Medical Director	1997
Laboratory	1994

ANATOMIC PATHOLOGY

Chief	2745
Chief Resident, Anatomic Pathology	2744
Staff Pathologists	2743
Secretarial Section (Reports/Case Inquiries)	3104
Histopathology Section	2243
Cytology Section (Ft Meade)	2194
Cytology Section (WRAMC)	2242
Special Pathology Section (Electron Microscopy)	2234
Morgue Section	1291

VETERINARY LABORATORY SERVICE (Fort Meade) 2930

FORENSIC TOXICOLOGY DRUG TESTING LABORATORY (Ft Meade)

Chief	3258
Laboratory	4076

EMERGENCY PROCEDURES SECTION

ACUTE CARE LAB AND PRIORITY LABS (CHEM, HEM, MICRO)

GENERAL POLICIES

The Acute Care Lab (ACL) located in Room 4D47, provides short turnaround time testing from a very restricted test menu (Table I) to a limited number of patient care areas: Wards 40, 41, 42, 43, 44, 45, 46, 49, Operating Rooms, Emergency Room, and the Pediatric Clinic. Turnaround time (TAT) is promised not to exceed 1 hour; in practice, TAT is much shorter, usually on the order of 10-20 minutes, depending on work volume. Specimens from other patient care areas can be tested in the ACL through pathologist consultation and approval (576-1000).

The Priority Laboratories, located in Rooms 2B30, 2B16, 2B32 and 2B41, deliver short turnaround time testing to all laboratory users. The test menu (Table II) is slightly expanded beyond what the ACL offers, and the TAT is promised not to exceed 4 hours.

Services in the ACL and Priority Labs are available 24 hours a day, 7 days a week.

SUBMISSION OF SPECIMENS

1. All specimens and their request slips must be clearly labeled. Accreditation standards from JCAH and CAP prohibit the processing of unlabeled specimens. Unlabeled specimens or specimens with improperly completed request slips will be destroyed. All request slips will include the following:

   a. Patient's name.
   b. FMP-SSN.
   c. Requesting physician.
   d. Date/time specimen collected.
   e. Test(s) requested.
   f. Ward or clinic.

Specimens will be clearly labeled with the patient's name and FMP-SSN.

2. All Acute Care Lab specimens will be delivered by submitting personnel to Room 4D47. Delivering individual should time/date stamp sample upon arrival in ACL. During duty hours, Priority Lab samples should be delivered to the Laboratory Front Desk, Room 2B07. Outside normal duty hours, submitters should bring all Priority Lab samples to Room 2B30. Enter 2B30, time/date stamp all request slips, and place samples in appropriately labeled baskets.

RETURN OF DATA

All ACL and Priority Lab work is accessioned into the TRILAB computer system, and all results are entered into the computer as soon as verified. The ultimate use of the 4th floor PDMS computer system for lab data reporting is

not settled, but in the meantime, ACL results (but not Priority Lab results) will be entered into the PDMS system as well as the TRILAB. Users are asked to keep telephone inquiries to a minimum, as these divert technologists from testing and prolong turnaround times. During periods when the computer system is down, results will be given to inquirers over the telephone.

HEMATOLOGY REQUESTS

Differential WBC counts will not be performed on WBC counts between 4,000 and 12,000 unless a separate Miscellaneous Form (SF 557) requesting differential accompanies the hematology request slip, or unless "DIFF PLEASE" is written prominently as close to the head of the hematology slip as possible.

TABLES

TABLE I - Acute Care Lab Tests Available

TABLE II - Priority Chemisty Lab Tests Available

TABLE III - Priority Microbiology Lab Tests Available

TABLE IV - Priority Clinical Microscopy Lab Tests Available

TABLE V - Hematology and Chemistry Lab Normals

TABLE I

ACUTE CARE LAB - 1 HOUR TAT

TESTS AVAILABLE

On Serum
(Red Top Tube)

Bilirubin, Direct (Newborns)
Bilirubin, Total (Newborns)
Electrolytes*
-Sodium (Na)
-Potassium (K)
-Chloride (Cl)
-Bicarbonate (CO_2)
Glucose
Osmolality

On Blood
(Lavender Top Tube)

Hematocrit
Hemoglobin
Platelet Count (instrument count only)
WBC, Total

On Plasma
(Blue Top Tube)

Prothromin Time
Activated Partial Thromboplastin Time

*Counts as one test

TABLE II

PRIORITY CHEMISTRY LAB - 4 HOUR TAT

TESTS AVAILABLE

SERUM	URINE
Acetone	Amylase
Albumin/Total Protein	Chloride
Alcohol	Creatinine
Amylase	Osmolality
Total Bilirubin	Potassium
Calcium	Sodium
Creatinine	Urea Nitrogen
Sodium	
Potassium	
Chloride	
Carbon Dioxide	
Glucose	
Osmolality	
Salicylates	
Urea Nitrogen	
Uric Acid	
Phosphorus	
Magnesium	

PROCEDURES OTHER THAN THOSE LISTED ABOVE REQUIRE PATHOLOGIST'S APPROVAL BEFORE TESTING

TABLE III

PRIORITY MICROBIOLOGY LAB - 4 HOUR TAT

TESTS AVAILABLE

1. Gram stain
2. Antigen testing
3. Culture

Performed in Microbiology from 0600 - 2300 hours.

Gram stain bench available in Room 2B16 from 2300 - 0600 hours.

PROCEDURES OTHER THAN THOSE LISTED ABOVE REQUIRE PATHOLOGIST'S APPROVAL BEFORE TESTING

TABLE IV

PRIORITY CLINICAL MICROSCOPY LAB - 4 HOUR TAT

TESTS AVAILABLE

On Blood
Lavender Top Tube

Hematocrit
Hemoglobin
S-Hemoglobin
Platelet Count
WBC Differential
WBC, Total

On Plasma
Blue Top Tube

Activated Partial Thromboplastin Time
Fibrinogen
Prothrombin Time
Thrombin-Time

On Fluids
Cell Count
Differential

On Urine
Urinalysis with microscopics
Pregnancy Test

Available 24 hours per day in Room 2B41.

TABLE V

ACUTE CARE AND PRIORITY LAB NORMALS

HEMATOLOGY SECTION

Activated Partial Thromboplastin Time	27-39 sec
Fibrin Split Products	< 10 mg/dl
Fibrinogen	132-364 mg/dl
Hematocrit (Male)	42-52%
Hematocrit (Female)	37-47%
Hemoglobin (Male)	14-18 g
Hemoglobin (Female)	12-16 g
S-Hemoglobin (Screen)	Negative
Platelet Count (Est)	180-450,000/mm3
Prothrombin Time	10-13 sec
Thrombin Time	+ 2 sec of TT Control
White Blood Cell Count	$\overline{7}.8$ X10^3 $\pm$ 3.0

CHEMISTRY SECTION

Acetone (Serum)	Negative
Acetone (Urine)	Negative
Albumin	3.8-4.8 g/dl (ACA)
Alcohol	Negative
Amylase (Serum)	18-106 IU/L
Amylase (Urine)	4-37 IU/L/2 Hrs
Bicarbonate (CO_2)	22-29 mEq/L (ACA)
Bilirubin (Direct)	0-0.4 mg/dl (ACA)
Bilirubin (Total)	< 1.5 mg/dl
Calcium	8.7-10.2 mg/dl (ACA)
Chloride (Serum)	97-108 mEq/L
Chloride (Urine)	170-254 mEq/L/24 Hrs
Creatine (Serum)	0.7-1.5 mg/dl (ACA)
Creatine (Urine)	0.8-2.0 g/24 Hr (ACA
Glucose (Serum)	70-110 mg/dl (ACA)
Glucose (CSF)	2/3 Serum Level
Monospot	Negative
Osmolality (Urine)	390-1090 mOsmol/kg
Potassium (serum)	3.4-5.0 MEG/L
Potassium (Urine)	26-123 mEq/24 Hrs
Salicylates (Serum)	Negative
Salicylates (Urine)	Negative
Sodium (Serum)	137-145 mEq/L
Sodium (Urine)	43-217 mEq/24 Hrs
Total Protein (Serum)	6.4-8.2 g/dl
Total Protein (CSF)	14-45 mg/dl (ACA)
Urea Nitrogen (Serum)	8-25 mg/dl (ACA)
Urea Nitrogen (Urine)	12-20 mg/24 Hr
Uric Acid	3.5-8.7 mg/dl

Phosphorus	2.5-4.9 mg/dl
Magnesium	1.8-2.4 mg/dl
Alkaline Phosphatase	2.5-9.7 U/dl
CPK	2.1-232 U/L
LDH	100-190 U/L
SGOT	25-41 U/L
SGPT	3-36 U/L
Ammonia (adults)	20-30 micromoles/L
(newborns)	50-70 micromoles/L
(premature)	90-100 micromoles/L

BLOOD BANK SECTION

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BLOOD BANK

1. GENERAL INFORMATION

a. Location: Room #2B46

b. Telephone: Medical Director, Chief and NCOIC - 576-1989/1990
Main Lab - 576-1989/1990
Donor Center - 576-3372/4156
Apheresis Unit - 576-4174/4175
Civilian Supervisor - 576-1989

c. Hours of Operation: The Blood Bank is open at all times, although many products and services are available only during regular duty hours.

d. Physician Coverage: Senior staff and residents from the Department of Pathology are available at all times for consultation and authorization of special products and services. The "Blood Bank Pathologist On-Call" may be reached by contacting the Blood Bank Main Lab or hospital page operator.

2. BLOOD AND BLOOD PRODUCTS - GENERAL POLICIES

a. Ordering Blood and Blood Products

(1) Requisition, Sample, Patient Identification: All requests for blood or blood products must be submitted on SF 518 and must be accompanied by a properly drawn specimen. The patient's identification must be positively established at the time the specimen is drawn by using the patient's wrist band to complete the "Patient Identification" Section of the SF 518 and by placing the identical information on the blood tube label. Both the blood tube label and the SF 518 must contain the patient's full name, family designator prefix, and sponsor's Social Security Number. The inpatient addressograph plate should be used to stamp the SF 518. In addition, the tube label must contain the date drawn and the initials of the phlebotomist; the phlebotomist also must sign the appropriate block in Section I of the SF 518. If any portion of this information is missing or illegible on either the tube or the SF 518, or if the information on the tube does not completely match that on the SF 518s submitted, the sample and paperwork cannot be accepted. If the patient is to undergo a surgical procedure, the block in Section I entitled "Diagnosis" must indicate the type of procedure to be performed rather than the clinical diagnosis.

(2) Priority: Requests for blood are prioritized based on the urgency of the clinical situation.

(a) Uncrossmatched - Group O - Uncrossmatched O positive or O negative packed red blood cells are given to patients for whom there is insufficient time to establish their ABO-Rh group and to complete a standard crossmatch (TAT less than 5 minutes). This should only very rarely be necessary; type-specific blood is preferable in this situation and can be provided nearly as rapidly (See Group Specific Uncrossmatched).

(b) Group Specific Uncrossmatched: Uncrossmatched ABO-Rh type specific packed cells are given to patients for whom there is time to determine the ABO-Rh status but not to complete a standard crossmatch (TAT less than 10 minutes).

(c) Emergency - Immediate Spin Crossmatch: Incompletely crossmatched ABO-Rh compatible blood is given to the patient following an abbreviated immediate spin saline crossmatch (TAT 15 minutes).

(d) STAT: ABO Rh compatible blood is given to the patient following a complete crossmatch, antibody screen, and ABO-Rh typing (1-2 hours).

(e) All other requests for blood will be prioritized depending on the time the blood is needed as indicated by "Date and Hour Wanted" block in Section I of the SF 518. Written requests for routine orders may be upgraded to any emergency priority by notifying the Blood Bank if the patient's condition changes.

(3) Ward Notification: The Blood Bank will notify the ward as soon as STAT requests are completed.

(4) Maximum Surgical Blood Order Schedule: Units of blood should not be crossmatched for a patient unless the chances are high that the units will be transfused. Unnecessary crossmatching jeopardizes patient care by making units unavailable for patients who actually need the blood, by increasing the risk of hemolytic transfusion reactions due to errors arising from needlessly heavy workload, by increasing the outdating and wastage of volunteer donor blood, and by diverting technical staff from the role of careful pre-transfusion testing to that of shipping and receiving blood from outside facilities. The Maximum Surgical Blood Order Schedule (MSBOS) indicates the maximum number of units of blood which will be crossmatched for a given surgical or medical procedure; it also designates certain procedures for which only a "type and screen" will be performed. If medically indicated, the patient's physician should contact the Blood Bank pathologist on-call to arrange for crossmatching the units instead of a type and screen or crossmatching more units than specified by the MSBOS. Appendix A contains the details of the WRAMC MSBOS, including an explanation of the "type and screen" system, and should be consulted whenever ordering blood to determine how many units will be set.

(5) Restricted Products: Most special products and services handled by the Blood Bank are available only through prior arrangement. When such products are needed, the patient's physician must contact the Blood Bank pathologist on-call to establish that the appropriate medical indications exist and that the product is available. These restricted products include: frozen red blood cells, washed red blood cells, platelet concentrates, fresh frozen plasma, cryoprecipitate, Factor concentrates, autologous blood, platelet pheresis units, granulocyte concentrates, therapeutic phlebotomy, plasmapheresis and plasma exchange.

(6) Release of Crossmatched Units: All units of blood crossmatched on a particular day will be released between 0030 and 0700 hours, two calendar days later (e.g., blood crossmatched 1 May is released between 0030 and 0700

hours on 3 May). Units returned from the OR will be released by 0700 hours the day following surgery. The patient's physician may contact the Blood Bank pathologist on-call by 0700 hours to request that units be held for an additional period.

(7) Deadline for Submission of Operating Room Requests: Requests for elective Operating Room cases must be submitted no later than 1400 hours of the day preceding the scheduled surgery. Specimens and requests received after this time will not be processed unless the patient's physician obtains the approval of the staff pathologist on-call.

b. Issue of Blood to Wards

(1) Prescription Form: Blood will be issued to physicians and ward personnel upon presenting a properly completed prescription form, DD 1289. The prescription must contain the patient's full name, family designator prefix, Social Security Number, blood product wanted, date, and the name of the physician requesting the blood. Units of blood will not be issued unless the patient identification is complete and corresponds in full to that on the SF 518s attached to the units.

(2) Family Members: Blood and blood products will not be issued to family members except for those individuals on previously established programs of home prophylaxis for hemophilia.

(3) Maximum Number of Units Issued: Except for emergency situations, only one unit of blood will be issued for a patient at one time. Two units may be issued to patients in the ICU's, recovery room, operating room, ER, or dialysis, who have more than one intravenous line available. Blood for only one patient may be picked up at a time.

(4) Storage of Blood on Wards: Under no circumstances will any blood or blood products be stored even for a brief period of time in refrigerators outside the Blood Bank. Blood should not be picked up from the Blood Bank until just prior to the intended transfusion. If a delay in starting the transfusion is anticipated, the unit should be returned to the Blood Bank immediately (within 30 minutes).

(5) Operating Room Policies:

(a) Deadline for Submisson of Requests: Requests for elective Operating Room cases must be submitted no later than 1400 hours of the day preceding the scheduled surgery. Specimens and requests received after this time will not be processed unless that patient's physician contacts the staff pathologist on-call for approval.

(b) Maximum Surgical Blood Order Schedule: The maximum number of units which will be crossmatched for a given procedure is established in the MSBOS (Appendix A). If additional units are medically indicated, the patient's physician must contact the Blood Bank pathologist on-call to arrange for crossmatching the appropriate number of units.

(c) Delivery of Blood to Operating Room: By 0700 hours, Monday through Friday, the Blood Bank personnel will deliver all requested blood to the Operating Room for that day's scheduled cases. All other blood and blood products will be delivered to the Operating Room either by Operating Room personnel or ward personnel. Blood intended to be split for pediatric cases will remain in the Blood Bank until patient is ready to be transfused.

(d) Release of Blood on Operating Room Patients: Unless the Blood Bank pathologist on-call is notified, units of blood crossmatched for Operating Room patients will be released to general inventory by 0600 hours the day following surgery.

(6) Transfusion of Blood and Blood Products:

(a) Patient Identification: Immediately prior to beginning a transfusion, the patient's wrist band identification should be examined and compared to the identification shown on the SF 518 attached to the unit of blood. If the name, family designator prefix, and Social Security Number on the SF 518 are not identical to that on the patient's wrist band, the transfusion must not be started and the Blood Bank must be notified immediately. Two individuals must verify the identification and document this by signing the relevant two blocks on Section III of the SF 518.

(b) Infusion Set: All blood and blood products must be administered through a standard blood infusion set containing the appropriate filter (140-170 microns). Although micropore (25-40 micron) filters may occasionally be useful for whole blood or red cell products, some micropore filters are not suitable for platelet concentrates, and therefore are not used for platelet infusions. Blood and blood products should not be mixed with any intravenous solutions or medications, with the exception that packed red blood cells may be mixed with normal saline to facilitate infusion.

(c) Rate of Infusion: During the first ten minutes, the infusion should be administered rather slowly with close observation of the patient. If no adverse reaction is observed, the blood or blood product then may be administered as quickly as possible without provoking problems with fluid overload.

(d) Completion of Patient Transfusion Record, SF 518: Prior to beginning the transfusion, the "Administration" portion of Section III - Record of Transfusion, must be completed by the individual starting the transfusion; a second individual must verify the identification and sign in the "Verifier" block. Upon completion of the transfusion, the portion "Post Transfusion Data" of Section III - Record of Transfusion, must be completed and signed. The first copy of the completed SF 518 must be placed in the patient's chart and the second copy should be returned to the Blood Bank. NOTE: This policy is to be followed after any transfusion procedure including in the operating room.

(7) Transfusion Reactions:

(a) If a suspected adverse reaction to transfusion of blood or blood products occurs, immediately stop the infusion; allow the blood product to remain hanging and keep the vein open by infusion of normal saline. Immediately notify the patient's physician and the Blood Bank. The Blood Bank pathologist on-call will be notified and will consult with the patient's physician to determine the nature and severity of the problem and the diagnostic tests which will be performed to evaluate the reaction.

(b) If the Blood Bank pathologist on-call requests that a workup be performed, the following samples and requisitions must be submitted: 1) SF 513, Request for Consultation, filled in by the patient's physician and giving the following information - suspected unit number; time and date of reaction; nature of reaction including changes in temperature, pulse, blood pressure, respiration; symptoms such as nausea, vomiting, chest or flank pain, burning at site of infusion, chills, shortness of breath; physical findings such as juandice, bleeding diathesis, edema; and relevant lab data such as elevated liver function tests, hemoglobinuria, hemoglobinemia; 2) one 7 ml lavender top tube and two 7 ml red top tubes; 3) one freshly voided post-reaction urine; 4) the blood container and infusion set of the suspected unit; and, 5) the second copy of the completed SF 518 for the suspected unit. Retain the first copy of the completed SF 518 and place in the patient's chart.

(c) The Blood Bank pathologist on-call will directly notify the ward and/or patient's physician of the results of all tests immediately upon their completion. The SF 513 will be completed and returned to the patient's chart within 24 hours of the evaluation.

(d) The following types of suspected transfusion reactions should be reported to the Blood Bank: febrile, acute hemolytic, delayed hemolytic, anaphylactic, septic or infectious and post-transfusion hepatitis. Simple urticarial reactions with no change in vital signs need not be reported. The details of the types of reactions are found in Appendix D.

3. BLOOD AND BLOOD PRODUCTS AVAILABLE
(Copies of "Circular of Information for the Use of Human Blood and Blood Components by Physicians" are available in the Blood Bank).

a. WHOLE BLOOD:

(1) Composition: Total volume 513 ml containing 200 ml red cells, 250 ml plasma, 63 ml anticoagulant, and largely nonfunctional platelets and white cells.

(2) Indications: Replacement of acute massive blood loss.

(3) Availability: Inventory consists of red blood cell units and limited amounts of whole blood units. Either red blood cell units or whole blood units are available at all times. For the maximum number which will be crossmatched for a given procedure, see the MSBOS in Appendix A. Turnaround time depends on priority designation as in Section 2, para a(2)(a).

(4) Sample and Requisition: One SF 518 for each unit needed; one 7 ml clotted red top tube or 7 ml lavender top tube for each six units needed.

(5) Administration: Through standard blood administration set. Micropore filter systems may be acceptable when indicated. Units must not be mixed with intravenous fluids or medications other than normal saline.

(6) Hazards: Acute and delayed hemolytic transfusion reactions; allergic and anaphylactic reactions; post-transfusion hepatitis; sensitization to blood group antigens; septic shock from bacterial contamination.

b. RED BLOOD CELLS

(1) Composition: Total volume 225 to 350 ml containing 200 ml packed red cells, supernatant plasma, and largely nonfunctional platelets and white cells.

(2) Indications: Correction of inadequate hemoglobin-red cell mass.

(3) Availability: Same as whole blood.

(4) Sample and Requisition: Same as whole blood.

(5) Administration: Same as whole blood.

(6) Hazards: Same as whole blood.

c. FROZEN RED BLOOD CELLS

(1) Composition: Total volume 200 ml containing 170 to 190 ml of packed red blood cells; no plasma, less than 2% of original platelets and white cells.

(2) Indications: Correction of inadequate hemoglobin-red cell mass in:

(a) Patients with severe febrile leukoagglutinin reactions unresponse to medication, and unresponsive to use of microaggregate filter for transfusions.

(b) Patients with severe allergies to plasma proteins.

(c) Patients with frozen blood stored for use in autologous transfusion.

(3) Availability: Only during regular duty hours, Monday through Friday. Units cannot be made available earlier than 1200 hours on Monday. With the exception of frozen autologous units stored for a specific patient, patient's physician must contact Blood Bank pathologist on-call to determine that indications exist and that product is available. For the maximum number which will be crossmatched for a given procedure, see the MSBOS in Appendix A (TAT 4-6 hours). Frozen red cells should be transfused within 24 hrs of thawing.

(4) Sample and Requisition: Same as for whole blood, except request must be made by 1000 hours the day before the transfusion is required.

(5) Administration: Same as for whole blood.

(6) Hazards: Same as for whole blood except for substantial decrease in allergic, febrile, leukoagglutinin reactions.

d. EXCHANGE TRANSFUSION

(1) Composition: For hemolytic disease of the newborn or neonatal hyperbilirubinemia, the freshest unit of compatible blood will be selected. The total volume and desired hematocrit should be indicated by the patient's physician on the SF 518. Generally, a unit of Group O red blood cells less than 5 days old is mixed with an appropriate volume of Group AB fresh frozen plasma to obtain blood of the desired hematocrit.

(2) Indications: Used primarily for hemolytic disease of the newborn to reduce dangerous bilirubin level, replacement of deficient red cell hemoglobin mass, and removal of antibody coated red cells.

(3) Availability: Routinely available at all times. Turnaround time varies considerably depending on the complexity of the antibody problem in each case. The patient's physician should maintain close contact with Blood Bank to determine status of the crossmatch.

(4) Sample and Requisition:

- One SF 518 for each exchange.
- One 3 ml lavender top tube from infant.
- One 7 ml clotted red top or lavendar top tube from mother.

If maternal sample is not available, the patient's physician must sign a release form for incompletely crossmatched blood.

(5) Administration: Standard exchange transfusion procedure.

(6) Hazards: Same as for whole blood.

e. AUTOLOGOUS BLOOD PROGRAM

(1) Composition: Single units of whole blood are drawn from the patient and stored either in liquid state for 35 days or as frozen packed red cells for periods beyond 35 days.

(2) Indications: For replacement of red cell hemoglobin mass in patients scheduled for elective surgical procedures which ordinarily require transfusion support, and for patients with multiple red cell antibodies or rare blood groups who may require transfusion at some future time.

(3) Availability: Patient's physician must contact Blood Donor Center (63372) to make an appointment for the patient and must submit an

SF 513 consultation giving the following information: patient's name, family designator prefix, sponsor's Social Security Number, surgical procedure or other indication for autologous blood, date of planned surgery, total number of units to be drawn. To qualify for autologous transfusion, the patient must meet the standards of the American Association of Blood Banks for autologous donors, to include acceptable veins, a hemoglobin level above 11 gm/dl (hematocrit 34 percent), no history of hepatitis or recent exposure to individuals with hepatitis, and no current or recent infections. The patient's physician must ensure that the patient is given a prescription of iron supplements and is instructed to follow the prescription faithfully. If the patient is leaving the Washington, D.C. area and will need to have units drawn at other facilities and shipped to WRAMC, the patient's physician should notify the Donor Center when submitting the SF 513; only a few outside facilities are capable of proper handling of autologous donors, and units received from unauthorized facilities will not be accepted by the Blood Bank as autologous blood.

(4) Sample and Requisition:

(a) For entry of patient into program, SF 513 must be submitted (see previous paragraph).

(b) For transfusion of autologous blood, one SF 518 is required for each unit needed. NOTE: THE SF 518 MUST DESIGNATE "AUTOLOGOUS" BLOOD; otherwise, homologous, random donor units may be crossmatched. One 7 ml lavender or clotted red top tube for each six units is required. A complete ABO-Rh, antibody screen and crosmatch must be performed for all autologous units prior to transfusion.

(c) In cases where autologous units must be thawed, the Blood Bank preferably should receive the SF 518s and patient sample two days prior to surgery, but in any case NLT 1000 HOURS the day prior to surgery.

(5) Administration: Same as for whole blood.

(6) Hazards: Autologous blood virtually eliminates the many risks associated with homologous units (hepatitis, hemolytic transfusion reactions, allergic reactions), although bacterial contamination may pose a hazard and errors in blood and patient identification are still possible.

f. FRESH FROZEN PLASMA

(1) Composition: 175-250 ml of plasma containing approximately 0.7 to 1.0 units of all coagulation factors per ml fluid.

(2) Indications:

(a) Correction of acquired and inherited coagulation deficiencies of the prothrombin complex, V, XI, or XII, and for VIII and IX deficiencies when concentrates are not available.

(b) Replacement of fluid for plasma exchange.

(3) Availability: Patient's physician must contact Blood Bank pathologist on-call to determine that indications exist and that the product is available (TAT approximately 45 minutes).

(4) Sample and Requisition:

(a) One 3 ml or 7 ml clotted red top tube or lavender top if the patient has not been previously typed during the current admission.

(b) One SF 518 for each unit needed.

(5) Administration: Same as whole blood.

(6) Hazards: Same as whole blood except decreased risk of immune mediated transfusion reactions.

g. CRYOPRECIPITATE

(1) Composition: Each bag contains 8-12 ml volume with 80-100 units Factor VIII, 150-250 mg fibrinogen, 80 units Factor XIII, and 100 units von Willebrand's Factor. Multiple single bags are pooled to achieve desired dose.

(2) Indications:

(a) Treatment of hemophilia A (Factor VIII deficiency).

(b) Treatment of von Willebrand's disease.

(c) Treatment of Factor XIII deficiency.

(d) Treatment of fibrinogen deficiencies.

(3) Availability: At all times. Patient's physician must contact Blood Bank pathologist on-call to determine that indications exist and product is available (TAT 30 minutes).

(4) Sample and Requisition:

(a) One 3 ml or 7 ml clotted red top tube or lavender top if the patient has not been previously typed during the current admission.

(b) One SF 518 indicating total number of units of clotting factor needed.

(5) Administration: Multiple units are pooled by the Blood Bank and must be administered through a blood component infusion set.

(6) Hazards: Similar to whole blood; hepatitis risk is less than for commercial lyophilized Factor VIII concentrates.

h. LYOPHILIZED FACTOR VIII CONCENTRATE

(1) Composition: Factor VIII is recovered from a pool of multiple donors and provided in lyophilized form for reconstitution.

(2) Indications: Treatment of hemophilia A (Factor VIII deficiency); not usually suitable for von Willebrand's disease.

(3) Availability: At all times. Patient's physician must contact Blood Bank pathologist on-call to determine that indications exist and product is available (TAT 1 hour). Home treatment programs may be arranged by consultation with the Blood Bank Director. (See para 3p below)

(4) Sample and Requisition:

(a) One 3 ml or 7 ml clotted red top or lavender top tube if the patient has not been previously typed.

(b) One SF 518 indicating total number of Factor VIII units needed.

(5) Administration: Reconstituted by the Blood Bank; administered through standard infusion set or as slow push with syringe, after drawing up through filter needle.

(6) Hazards: Similar to whole blood except for very high risk of transfusion associated hepatitis. Association with transmission of AIDS is reported.

i. LYOPHILIZED FACTOR IX CONCENTRATE

(1) Composition: Lyophilized concentrate containing variable quantities of Factors II, VII, IX and X. Concentrate is reconstituted into solution prior to administration.

(2) Indications:

(a) Treatment of Hemophilia B (Factor IX deficiency).

(b) Treatment of deficiencies of Factors II, VII and X.

(c) Treatment of Factor VIII deficiency with associated inhibitors. Activated Factor IX concentrates (e.g., Autoplex) have been recommended for this indication by some authors.

(3) Availability: At all times. Patient's physician must contact Blood Bank pathologist on-call to determine that indications exist and product is available (TAT 1 hour).

(4) Sample and Requisition: Same as for Factor VIII concentrates.

(5) Administration: Same as for Factor VIII concentrates.

(6) Hazards: Same as for Factor VIII concentrates, with risk of consumptive coagulopathy.

j. PLATELET CONCENTRATE

(1) Composition: 5.5 to 7 x 10^{10} platelets per unit suspended in 50 ml plasma. For adults, multiple (usually 6) individual units are pooled to yield approximately 3 to 4 x 10^{11} plateletss in 300 ml plasma

(2) Indications: Treatment of thrombocytopenia or platelet functional defects as evidenced by:

(a) Platelet count less than 5000/microl with or without bleeding.

(b) Platelet count less than 20,000/microl with active bleeding.

(c) Platelet count less than 40,000/microl or bleeding time greater than 12 minutes in patient undergoing major surgery.

(3) Availability: At all times. Patient's physician must contact Blood Bank pathologist on-call to determine that indications exist and that the product is available (TAT approximately 30 minutes).

(4) Sample and Requisition:

(a) One 3 ml or 7 ml clotted red top or lavender top tube unless patient has been previously typed during the current admission.

(b) One SF 518 indicating total number of single units to be pooled.

(5) Administration: Through standard blood infusion set. Micropore filters (25-50 microns) must not be used without approval of the Blood Bank pathologist on-call. No medications or intravenous solutions may be mixed, including normal saline. Transfusions must be completed within four hours of pooling due to risk of bacterial overgrowth.

(6) Hazards: Same as for whole blood, with higher risk of bacterial contamination. Unnecessary transfusion hastens the appearance of the refractory state due to immunization against platelet antigens.

k. APHERESIS PLATELET CONCENTRATE

(1) Composition: Total volume 150-300 ml containing 3-5 x 10^{11} platelets and variable numbers of lymphocytes and red cells.

(2) Indications: Same as for platelet concentrates. Generally procured only for patients refractory to random donor platelet transfusions.

(3) Availability: Patient's physician must contact Blood Bank pathologist on-call to determine that indications exist and that product is available (TAT 24-48 hours).

(4) Sample and Requisition:

(a) One 3 ml or 7 ml clotted red top or lavender top tube.

(b) One SF 518.

(c) Crossmatching may be required if unit contains many red blood cells.

(5) Administration: Same as for platelet concentrates.

(6) Hazards: Same as for platelet concentrates, although exposure to fewer donors lessens risk of hepatitis.

1. APHERESIS GRANULOCYTE CONCENTRATE

(1) Composition: Total volume of 200-300 ml containing 1 to 2 x 10^{10} neutrophils, and variable numbers of lymphocytes, platelets and red blood cells.

(2) Indications: To be eligible for granulocyte transfusion, a patient must have a potentially reversible condition and must have met the following three criteria concurrently for at least 48 hours.

(a) Absolute granulocyte count less than 500 per microliter or documented granulocyte dysfunction (e.g., chronic granulomatous disease).

(b) Evidence of infection as shown by positive cultures and/or fever greater than 101°F for leukemia or positive cultures for solid tumors or granulocyte dysfunction disease.

(c) Administration of Triple Antibiotic or Culture-specific Antibiotic Therapy.

(3) Availability: Patient's physician must contact the Blood Bank pathologist on-call to determine whether indications exist and product is available. An SF 513 must be submitted containing at least the following information: age, sex, race, underlying disease, and specific indications as listed above. Initial turnaround time is 24-48 hours. Transfusions are planned for one unit a day for five to seven consecutive days, at which time the patient must be reevaluated for continuation of therapy. Blood Bank pathologist on-call must be notified immediately if the patient no longer needs the product.

(4) Sample and Requisition:

(a) One 3 ml or 7 ml clotted red top or lavender top tube and one SF 518 are required for crossmatching each day a granulocyte concentrate is issued.

(b) One SF 513 submitted prior to issuing the first unit of the series (see "Availability"); this will be returned with the first unit issued with a detailed description of the product and its administration.

(5) Administration: Same as for apheresis platelet concentrates with the following exception: the unit should be administered over 2-3 hours; faster infusion may increase the likelihood of reactions. Premedication may be indicated (see Consult report on SF 513).

(6) Hazards: Similar to whole blood with the following addition: febrile reactions to transfusion are common; see Consult report on SF 513 for more information on possible reactions and their treatment.

m. PLASMAPHERESIS AND PLASMA EXCHANGE

(1) Procedure: A specific volume of the patient's plasma is removed and replaced with saline, albumin and/or plasma.

(2) Indications:

(a) Treatment of selected patients with plasma factors (paraproteins, antibodies, immune complexes) which may be of pathogenic significance.

(b) Experimental protocols to evaluate the efficacy of an apheresis procedure in patients with a certain disease must be approved by the WRAMC Human Use Committee and Clinical Investigation Department.

(3) Availability: Generally during regular duty hours only. Patient's physician must contact Blood Bank pathologist on-call to determine if indications exist and if resources are available. Turnaround time 24-48 hours except in emergency situations. The patient's physician may be required to provide coverage for the procedure while the patient is undergoing the exchange. Procedures are performed in the Apheresis Unit or at the patient's bedside.

(4) Sample and Requisition:

(a) One 7 ml red top or lavender top tube unless the patient has been typed during the current admission.

(b) One SF 518 for each pooled unit of plasma.

n. THERAPEUTIC PHLEBOTOMY:

(1) Procedure: One unit of whole blood is removed from the patient and discarded.

(2) Indications: Inpatients requiring reduction of red cell mass or iron load.

(a) Hemochromatosis.

(b) Cyanotic congenital heart disease with polycythemia and hyperviscosity.

(c) Polycythemia vera.

(d) Certain patients with secondary polycythemia.

(3) Availability: Regular duty hours only. Patient's physician must contact Blood Donor Center to make arrangements and send patient with completed SF 513 indicating diagnosis, total number of units to be removed, and dates when phlebotomy should be performed.

o. Rh IMMUNE GLOBULIN

(1) Composition: Each vial contains 300 micrograms of the IgG fraction of immune anti-D (anti-Rho). The antibody is suspended in 2 ml of fluid for injection. Twenty micrograms are needed for each ml of red blood cells to be covered.

(2) Indications: To prevent sensitization to the D or Rho antigen following exposure of Rho or D negative individuals to the antigen.

(3) Availability: For Rh negative obstetrical patients after delivery, the product is routinely available at all times. The injection should be given within 72 hours of delivery or abortion. Rh immune globulin may be given antenatally to Rh negative women at the 28th week of pregnancy if they have not been sensitized to the Rh antigen and if their husbands are Rh positive. Women who have received Rh immune globulin antenatally remain candidates for postpartum Rh immune globulin administration if the infant is Rh positive. For non-obstetrical patients exposed to Rh positive blood, the patient's physician must contact the Blood Bank pathologist on-call to determine that appropriate indications exist (TAT is approximately 1 hour).

(4) Sample and Requisition:

(a) One 3 ml or 7 ml clotted red top tube.

(b) One 3 ml or 7 ml lavender or red top tube.

(c) One SF 518 indicating total number of vials needed (one vial of 300 micrograms will protect against 10 to 15 ml of Rh positive red blood cells).

(5) Administration: Injection should be given within 72 hours of exposure and must be administered by IM injection.

(6) Hazards: Allergic reactions may occur. Hemolytic transfusion reactions may result if Rh immune globulin is given to Rh positive patients.

p. HOME TREATMENT PROGRAM FOR HEMOPHILIA

(1) Home treatment programs for hemophilia may be requested only by staff members of the Hematology Services in the Departments of Medicine and Pediatrics.

(2) To enter a patient into the program, the patient's physician must submit to the Blood Bank an SF 513 request for consultation including the

following information as a minimum: patient's first and last name, family member prefix, sponsor's Social Security Number, age, sex, type of hemophilia or coagulopathy, precise quantity needed (expressed in units of activity), frequency of treatment needed, special problems (inhibitors, HBsAG positive, etc.), location of unit where consult should be returned and name of physician making request.

(3) The SF 513 will be completed by the Blood Bank Medical Director and returned to the requesting physician giving confirmation of the availability and schedule of treatment.

(4) Any change in the quantity or frequency of treatment, including vacations or prolonged absences, must be coordinated in advance with the Blood Bank. The patient's physician must contact the Blood Bank pathologist on-call at least thirty (30) days in advance and state the quantity needed and the details of the change in the treatment schedule.

(5) The patient or an adult family member may pick up the product from the Blood Bank by notifying the Transfusion Service in advance of the time and number of units needed. If the quantity or frequency of treatment differs from that established by the patient's physician, the additional units must be approved by the pathologist on-call as for any special product, and the patient must presnet a prescription form (DD 1289) containing the patient's name, family member prefix, sponsor's Social Security number, type and number of units needed, and physician's signature.

(6) The patient's physician must insure that the patient is thoroughly trained in the methods of storage, preparation, and infusion of the product and is also aware of the hazards and complications. The Blood Bank staff is not trained in the details of product infusion methods or treatment of adverse reactions and should not be expected to provide such information to patient.

(7) Infusion sets, filters, syringes and other items needed for administering the products are not available in the Blood Bank and must, therefore, be furnished by the patient's physician.

(8) For questions or inquiries pertaining to the program, contact the pathologist on-call at the Blood Bank, ext 61989/61990.

4. TESTS AVAILABLE

a. ABO AND Rh TYPING: The patient's red cells are typed to determine the ABO group and Rh type.

(1) Sample: One 3 ml or 7 ml red top tube.

(2) Requisition: SF 556.

(3) Availability: During regular duty hours with turnaround time of 4-8 hours.

(4) Comment: ABO and Rh typing are automatically performed concurrently with crossmatching, and type and screen; therefore, no additional sample or requisition needs to be submitted for ABO and Rh typing when these procedures have been requested.

b. ANTIBODY DETECTION AND IDENTIFICATION: The patient's serum is reacted against red cells of known antigenic composition to detect and identify clinically significant red cell antibodies.

(1) Sample: Two 7 ml red top tubes and one 7 ml lavender top tube.

(2) Requisition: SF 556.

(3) Availability: Generally only during regular duty hours (except in conjunction with a crossmatch) with turnaround time of one hour to several days, depending on complexity of antibodies present.

(4) Comment: Antibody detection (antibody screen) is performed concurrently with crossmatches, and type and screen; therefore, no additional sample or requisition needs to be submitted for antibody screen when these procedures are requested. Additional samples (two red top and one lavender top tubes) will be requested for workup if the antibody screen is positive.

c. ANTIBODY TITER: For obstetrical patients with antibodies capable of causing hemolytic disease of the newborn, the serum will be tested by serial dilution to determine titer.

(1) Sample: Two 7 ml red top tubes and one 7 ml lavender top tube.

(2) Requisition: SF 556.

(3) Availability: Routinely during regular duty hours (TAT approximately one day).

d. DIRECT ANTIGLOBULIN TEST (Direct Coomb's Test): The direct Coomb's test detects immunoglobulins, complement components, and certain other proteins attached to the patient's red cells.

(1) Sample: One 7 ml lavender top tube.

(2) Requisition: SF 556.

(3) Availability: Routinely during regular duty hours (TAT one day).

e. COLD AGGLUTININS: Serum patients with suspected cold hemaglutinin disease is tested at 1:32 dilution. If positive, titer, specificity and thermal amplitude are determined.

(1) Sample: One 7 ml red top tube and one 7 ml lavender top tube kept at 37° during delivery to Blood Bank.

(2) Requisition: SF 556.

(3) Availability: By consult only. Patient's physician must contact Blood Bank pathologist on-call for approval. Requests for cold agglutinin titers for diagnosis of mycoplasma infection will be forwarded to Microbiology Section, Fort Meade MD.

f. HBsAG TEST: A sensitive enzyme immunoassay is used to detect Hepatitis B surface antigen in the patient's serum.

(1) Sample: One 7 ml red or lavender top tube.

(2) Requisition: SF 556.

(3) Availability: Routinely available. Tested in batches during regular duty hours with turnaround time of 1-7 days.

(4) Comment: Negative results do not rule out Hepatitis B; test is of no value for Hepatitis A or for Non-A or Non-B Hepatitis.

g. CORD BLOOD WORKUP: The cord blood is typed to determine the ABO group and Rh type. A direct Coomb's test is performed and, if positive, the coating antibody is identified.

(1) Sample: One 7 ml lavender top tube containing cord blood.

(2) Requisition: SF 556; the mother's ABO group and Rh type should be indicated on the requisition if known.

(3) Availability: Routinely available at all times. Turnaround time 1 hour.

(4) Comment: Results are telephoned or transmitted by computer to Newborn Nursery. An unsensitized Rh negative woman whose infant is found to be Rh positive, is a candidate for administration of Rh immune globulin (see paragraph 3o). A positive direct Coomb's indicates the possibility of hemolytic disease of the newborn.

h. PRENATAL WORKUP: The prenatal sample is typed to determine the ABO group and Rh type. An antibody screening test is performed. If positive, the causative antibody is identified. If an antibody capable of causing hemolytic disease of the newborn is identified in the serum, it is tested by serial dilution to determine the titer.

(1) Sample: One 7 ml red or lavender top tube. (Additional samples may be requested at the next visit if a positive antibody screen in detected.)

(2) Requisition: SF 556.

(3) Availability: Routinely during regular duty hours (TAT approximately one day).

(4) Comment: Serial antibody titers are recommended in cases where an antibody capable of causing hemolytic disease of the newborn is identified (see paragraph 4c). An unsensitized Rh negative woman is a candidate for post-partum administration of Rh immune globulin if her infant proves to be Rh positive (see paragraphs 3o and 4g).

APPENDIX A

MAXIMUM SURGICAL BLOOD ORDERING SCHEDULE

PROCEDURE	# UNITS CROSSMATCHED OR TYPE AND SCREEN (T/S)
Abdominal abscess drainage	T/S
Abdominal paracentesis	T/S
Abdominoperineal resection	5
Abscess - drainage of abdominal, liver, lung	T/S
Adenoidectomy	Ø
Adhesion, lysis for intestinal obstruction	T/S
Adrenalectomy	4
Amputation of:	
Arm	T/S
Cervix	T/S
Finger	Ø
Foot	Ø
Forequarter	4
Hand	Ø
Leg . . A/K . . B/K	T/S
Supra Condylar	T/S
Toe	Ø
Transmetatarsal	Ø
Anal fissure, excision of	Ø
Anal Polypectomy	Ø
Aneurysm - Abdominal resection (AAA)	10
Thoracic	10

Aorto-femoral bypass graft (AFB, for ischemia)	6
Aorto-femoral bypass (with AAA)	1Ø
Aorto-iliac bypass graft (for AAA)	1Ø
Aortic valve replacement (AVR)	6
A - P repairs combined incontinence	T/S
Appendectomy	T/S
Arm amputation . [(depends where) interscapulo thoracic=4]	T/S
Arteriography (General)	T/S (O)
Arthroscopy (with or without meniscectomy)	Ø
Arthrotomy	Ø
Atrial septal defect (ASD)	6
Augmentation mammoplasty	T/S
Bartholin's gland excision	T/S
Bateman Procedure Hip	2
Biopsy, bone marrow, liver, breast, kidney, vaginal, etc.	T/S
Biopsy, lymph node, skin, muscle, gland (depends on case)	Ø
Bladder tumor, transurethral resection	T/S
Bone graft	T/S
Bone marrow biopsy	Ø
Branchial cleft cyst	T/S
Breast biopsy	T/S (Ø)
Bronchogram	Ø
Bronchoscopy	T/S (Ø)
Caldwell luc (nasal septum)	Ø
Cancer face electrocoagulation	Ø

Carotid artery ligation	T/S
Carotid endarterectomy	T/S
Carotid endarterectomy, redo	2
Carpal ligament division	Ø
Cauterization, cervix	Ø
Cervical laminectomy	2
Cervical polypectomy	Ø
Cervical rib resection	T/S
Cervical spine fusion, one level, anterior	T/S
Cervical spine fusion, posterior or anterior	2
Cervix amputation or cervical conization	T/S
Cervix cauterization	Ø
Cesarean section	T/S
Cesarean section, placenta previa or multiple births	2
Chalazion, excision of	Ø
Cholecystectomy - and CD exploration	T/S
Cholecysto-enterostomy	T/S
Cholecystogastrostomy	T/S
Cholecystojejunostomy	T/S
Circumcision	Ø
Cleft palate repair	2 ped packs
Coarctation of the aorta, correction	4
Colon resection:	
Hemi-colectomy	2
Low anterior resection	4
Sigmoidectomy	2

Small bowel segment	2
Total large colon	2
Colostomy	T/S
Colostomy closure	T/S
Colostomy, repair, revision of	T/S
Composite (radical neck and mandible) resection	4
Condylomata, penile, vaginal excision	Ø
Conization	T/S
Cord tumors, removal of (varies with purpose)	4
Coronary vein graft (single, double or triple)	6
Craniofacial reconstruction	2
Cranioplasty	2
Craniotomy and excision of mass	6
Craniotomy, aneurysm (varies with case)	4-6
Cystectomy, partial with or without dissection	2
Cystectomy, partial or with ureteral transplant	2
Cystectomy, total with ileal/colonic conduit	6
Cystocele repair	T/S
Cystoscopy	Ø
Cystotomy	T/S
Cystotomy, implant of radium	Ø
Dacryocystorhinostomy	T/S
Debridement and closure wound	T/S
Decortication of lung	2
D & C (dilation and curettage)	T/S
Diaphragmatic hernia	T/S

Dilation and curettage	T/S
Dilation urethra	Ø
Disc, excision, thoraco-lumbar, fusion, anterior	2
Disc fusion	T/S
Diverticulum, Meckel's, excision of	T/S
Dressing change	Ø
Ectopic pregnancy	2
Esophagectomy	4
Esophagogastrectomy	4
Exenteration, pelvic	6
Exploratory laparotomy	2
Exploratory thoracotomy	4
Femoral endarterectomy	T/S
Femoral-femoral bypass, graft	4
Femoral popliteal bypass, graft	6
Finger amputation	Ø
Fissure, anal, excision of	Ø
Fistula, bronchopleural	2
Fistula, repair:	
Anal	Ø
Retro vaginal	Ø
Vesicovaginal	T/S
Foot amputation	Ø

Gastrectomy, with or without vagotomy:

Subtotal	4
Total	4
Gastroenterostomy	T/S
Gastroscopy	Ø
Graft, bone	T/S
Hand amputation	Ø
Harrington rod	4
Hematoma, subdural, epidural	2
Hemicolectomy	2
Hemorrhoidectomy	T/S (Ø)
Hepatectomy	6
Hepaticojejunostomy	4

Hernias:

Hiatal, diaphragmatic, transthoracic	T/S
Incisional	Ø
Inguinal	Ø
Umbilical	Ø
Ventral	Ø
Hip, Bateman prosthesis	2
Total replacement	4
Hypospadias repair	T/S

Hysterectomy:

Abdominal (TAH)	T/S
Abdominal, with exploratory	2

Hysterectomy (continued):

Radical (Wertheim)	4
Vaginal	T/S
Hysterectomy, with repair	T/S
Hysterotomy	T/S
Ileal conduit	2
Ileotomy, ileostomy	T/S
Incision and drainage of abscess, deep and superficial	Ø
Incisional hernia	Ø
Inguinal hernia	Ø
Jaw resection with neck, tongue dissection	4
Jejunostomy	T/S
Knee, reconstruction	Ø
Knee, total replacement	2
Laminectomy	2
Laminectomy, recurrent HNP	T/S
Laparotomy, exploratory	2
Laparotomy, gyn staging (pelvic/aortic lymph node biopsies)	2
Laparotomy, lysis of adhesions (gyn)	T/S
Laparoscopy and bilateral tubal ligation	T/S
Laryngectomy with radical neck dissection	6
Leg amputation . . . . A/K (above knee)	T/S
B/K (below knee)	T/S
Ligation carotid artery	T/S
Ligation inferior vena cava	2

Liver abscess drainage	T/S
Liver biopsy	T/S
Lumbar laminectomy	2
Lung abscess drainage	T/S
Lung biopsy (open)	4
Lung decortication	2
Mammoplasty, reduction	T/S
Marshall-Marchetti	T/S
Marsupialization of Bartholins gland cyst	Ø
Mastectomy, radical	2
Mastectomy, simple	T/S
McBride (bunion surgery)	Ø
Mediastinoscopy	T/S
Meniscectomy	Ø
Mitral valve replacement	6
Nasal polypectomy	Ø
Neck dissection, radical	2
Nephrectomy	4
Nephrolithotomy	2
Nephrostomy	T/S
Nerve:	
Brachial plexus exploration	2
Graft	Ø
Graft, exploration	T/S
Repair	Ø
Section	Ø

Nose, open and closed reduction	Ø
Nose, plastic repair	Ø
Oophorectomy or ovarian cyst removal	T/S
Open heart surgery	6
Open prostate biopsy	T/S
Open reduction fracture, femur	T/S
Open reduction fracture, tibia	T/S
Orbitotomy	T/S
Orchiectomy	Ø
Orchiectomy with retroperitoneal node dissection	6
Orchiopexy	Ø
Osteotomy biopsy	T/S
Ovarian cystectomy	T/S
Ovarian wedge resection	T/S
Pacemaker change	Ø
Palmar fasciectomy	Ø
Pancreatectomy:	
Partial	4
Radical (Whipple)	6
Parathyroidectomy	T/S
Parotidectomy	T/S
Pelvic examination	Ø
Pelvic exenteration	6
Penectomy, radical or with node dissection	2
Penile prosthesis	Ø
Penis, partial amputation	Ø

Pilonidal cyst	Ø
Pneumonectomy	4
Polypectomy	T/S (Ø)
Portocaval shunt	1Ø
Proctoscopy, with or without fulguration or excision polyp	Ø
Prostatectomy:	
Radical	6
Suprapubic	4
Transurethral	T/S
PTCA -angioplasty	T/S
Putti-Platt	T/S
Pyelolithotomy	T/S
Radical mastectomy	2
Radical neck dissection	2
Radon seed, radium, cesium insertion	
Application to tongue, cervix or urethra	Ø
Ramstedt op (pyloroplasty)	T/S
Rectal polyp, excision	Ø
Rectocele repair	T/S
Reduction mammoplasty	T/S
Renal biopsy, open and closed	T/S
Replacement of aortic valve with pump	6
Replacement mitral or aortic value with pump	6
Rhinoplasty	Ø
Rib resection, cervical	T/S

Salpingectomy	T/S
Salpingo-oophorectomy	T/S
Salpingoplasty (tuboplasty)	T/S
Septal defects:	
Atrial (ASD)	6
Ventricular (VSD)	6
Shoulder surgery (Putti-Platt for dislocated shoulder)	T/S
Shunt, ventriculoperitoneal, atrial	T/S
Sigmoidoscopy	Ø
Sigmoid resection	2
Simple mastectomy	T/S
Skin flap	T/S
Skin graft	T/S
Spinal fusion	4
Splenectomy, abdominal or transthoracic	2
Subdural, epidural hematoma	2
Suprapubic prostatectomy	4
Sympathectomy	T/S
Thoracic aneurysm	1Ø
Thoracic laminectomy	2
Thoracic wall resection and reconstruction	2
Thoracoplasty, conversion	T/S
Thoracotomy (depends on purpose)	T/S
Thoracotomy, exploratory	4
Thymectomy	T/S

Thyroidectomy:

Partial	T/S
Total	T/S
Tonsillectomy	Ø
Total hip	4
Total knee	2
Tracheostomy	T/S
Transcolonic polypectomy	T/S
Transphenoidal hypophysectomy	T/S
Transthoracic hernia	T/S
Transurethral resection, bladder tumor	T/S
Tubal ligation, bilateral and laproscopy	T/S
Tuboplasty	T/S
Tumor (neuro)	4-8
Tympanotomy, exploratory	Ø
Umbilical hernia	Ø
Ureteral transplant	T/S
Ureterolithotomy	T/S
Ureterostomy	T/S
Ureterotomy	T/S
Urethral dilation	Ø
Urethroplasty or sling operation	T/S
Vaginal (rectovaginal) fistula repair	T/S (Ø)
Vaginal reconstruction	2
Vagotomy	T/S

Valve replacement	6
Aortic	6
Mitral	6
Varicose veins, ligation & stripping, bilateral, unilateral	Ø
Vasectomy	Ø
Ventral hernia	Ø
Ventricular septal defects	6
Ventriculo peritoneal shunt	T/S
Vertebrectomy	4
Vulvectomy:	
Simple	T/S
Radical	4
Whipple, radical pancreatectomy	6
Wound dehiscence	T/S

APPENDIX B

COAGULATION FACTORS

FACTOR	NAME	CONCENTRATION NEEDED FOR STASIS	INFUSED HALF LIFE IN VIVO	IN VIVO RECOVERY AS % INFUSED DOSE	THERAPEUTIC MATERIAL
I	Fibrinogen	70-100 mg/dl	96-144 hrs	50%	Cryoprecipitate
II	Prothrombin	35-40%	70-90 hrs	40-80%	Factor IX Prothrombin complex conc.
V	Proaccelerin	10-15%	12-24 hrs	50-80%	Plasma
VII	Proconvertin	5-10%	4-6 hrs	70-80%	Factor IX prothrombin complex conc.
VIII	Antihemophilic Factor	10-40%	12-15 hrs	50-80%	Plasma, Cryoprecipitate, Factor VIII conc.
IX	Plasma Thromboplastin Component	10-40%	18-24 hrs	25-50%	Plasma, Factor IX, prothr. complex conc.
X	Stuart Factor	10-20%	48-60 hrs	50-100%	Plasma, Factor IX. prothr. compex conc.
XI	Plasma Thromboplastin Antecedant	Possibly 30%	60-80 hrs	90-100%	Plasma
XII	Hageman Factor	Not Established	50-70 hrs	Not Established	Not Needed
XIII	Fibrin Stabilizing Factor	1-5%	96-148 hrs	50-100%	Plasma, cryoprecipitate
Platelets	Platelets	30-50, 000/ul for major surgery	72-96 hrs	30-60%	Platelet conc.

APPENDIX C

TRANSFUSION REACTIONS

1. URTICARIA

a. Clinical:

(1) Usually a comparatively benign event.

(2) Irregular, raised, red blotches of variable size (HIVES).

(3) Appear within a relatively short time after initiation of the transfusion (minutes).

b. Pathogenesis:

(1) Liberation of vaso-active amines from mast cells.

(2) Usually due to plasma constituents

c. Lab Investigation: Not required.

d. Suspected Reaction:

(1) Stop transfusion but keep line open.

(2) Record check.

(3) Observe patient.

(a) If reaction severe, terminate infusion and treat accordingly.

(b) If reaction is limited to mild urticaria, may continue infusion (+ antihistamines).

2. ANAPHYLACTIC REACTIONS

a. Clinical:

(1) These reactions are quite serious; can be fatal.

(2) Generalized flushing, bronchospasms with difficult breathing, and sometimes severe gastrointestinal distress.

(3) May occur following infusion of only a few mls of blood.

b. Pathogenesis:

(1) Most often seen in patients who are totally IgA deficient and have formed antibodies against IgA or one of its subunits.

(2) May occur in patients with no history of previous transfusion or pregnancy.

3. FEBRILE NON-HEMOLYTIC TRANSFUSION REACTIONS

a. Clinical:

(1) Common, especially in multiple transfused patients.

(2) Increase in body temperature, chills, tightness in chest, and tachycardia.

(3) Severe reactions - generalized prostration, malaise, and pulmonary insufficiency.

(4) Usually occur from within 30 minutes to four hours following initiation of transfusion.

b. Pathogenesis:

(1) Generally, immunologic response to white blood cells.

(2) Antibodies may be present in either recipient or donor serum.

(3) Antibodies may produce direct cytotoxicity.

(4) Antibodies may activate the complement system

4. HEMOLYTIC TRANSFUSION REACTIONS

a. Definition: A measurable increase in the rate of destruction by isoantibodies, or erythrocytes of either donor or recipient, after transfusion of blood.

b. Criteria:

(1) Physical signs and/or symptoms suggestive of hemolytic reactions.

(2) Laboratory proof of intravascular hemolysis.

(3) Detection and identification of antibodies and corresponding antigens responsible for red blood cell destruction.

(4) Progressive increase in titers of implicated antibodies at intervals following the infusion.

c. Classification:

(1) Lysis of donor cells.

(a) Immediate.

(b) Delayed.

(c) Interdonor hemolytic reaction.

(2) Lysis of recipient cells by passively transfused antibody.

d. Clinical:

(1) The most serious transfusion reaction.

(2) Fever, chills, flushing, back and chest pain, heat along vein, unexplained acute bleeding, hypotension, hemoglobinuria, anemia, and a large number of subjective complaints.

(3) Usually immediate but can be delayed for days after initiation of the infusion.

e. Massive Intravascular Hemolysis:

(1) Massive increase in plasma hemoglobin resulting in:

(a) Increased methemoglobin.

(b) Increased hemoglobin dimers.

(c) Haptoglobin is decreased (usually to zero).

(d) Turns plasma pink at 25 mg/dl.

(2) Increased methemoglobin leads to:

(a) Increased heme.

(b) Increased globin.

(3) Increased heme results in increased methemalbumin:

(a) Within five hours.

(b) Persists for 24 hours.

(c) Gives plasma a muddy brown appearance.

(d) Decreased hemopexin.

(4) Hemoglobin in RE system is increased resulting in increased unconjugated bilirubin.

(5) Bilirubin is converted to conjugated bilirubin and urobilinogen by the liver.

(6) Summary: Plasma ↑Hemoglobin, ↑methemoglobin
↑Methemalbumin, and ↑indirect bilirubin
Urine: Hemoglobinuria, hemosiderin, and
↑urobilinogen
Direct Coomb's Test: Usually positive

f. Disseminated Intravascular Coagulation (DIC):

(1) Definition: A hemorrhagic diathesis resulting in consumption of coagulation factors.

(2) Pathogenesis: All forms of intravascular hemolysis can initiate DIC (PNH, sickle cell anemia, PCH, etc.).

(a) Erythrocytin release with lysis of RBC.

- Phospholipid.

- Platelet factor 3 like activity.

- By itself probably an insufficient stimulus for major degrees of DIC.

(b) Blockade of RE system markedly enhances intravascular coagulation.

(c) Substances released from incompatible erythrocytes produces a more marked intravascular coagulation than those released from compatible cells (suggests Ag-Ab reaction mediation).

- Complement mediated activation of platelets.

- Ab-Ab-Cpx mediated activation of platelets.

- Ag-Ab-Cpx mediated activation of Hageman Factor.

- Ag-Ab-Cpx mediated lysis of leukocytes with release of substances activating the coagulation system.

g. Acute Renal Failure: The most frequent serious complication of acute hemolytic transfusion reactions is acute renal failure due to acute tubular necrosis. This lesion still carries an approximately 50% mortality rate.

Mechanism: A preferential renal cortical ischemia and an associated aberration in glomerular afferent - efferent arteriolar tone results in a decreased glomerular filtration with subsequent decrease in urine output and tubular ischemia.

h. Extravascular Hemolysis:

(1) Ag-Ab complex does not result in direct hemolysis of the RBC.

(2) Antibody coated cells are removed by RE cells in which lysis of RBC occurs.

(3) Released Hgb is then metabolized:

(a) Fe $\longrightarrow$ Transferrin.

(b) Globin $\rightarrow$ metabolized to amino acids.

(c) Hb $\longrightarrow$ bilirubin.

(4) Bilirubin transferred to liver and conjugated.

(a) Formation of urobilinogen.

(5) Net result in:

(a) ↑ Plasma bilirubin levels (mostly indirect).

(b) ↑ Fecal urobilinogen.

(c) Positive Direct Coomb's (always).

5. DELAYED HEMOLYTIC TRANSFUSION REACTION

a. Clinical: Occurs on the average of 8 days following the infusion (range 3 to 21 days).

b. Triad:

(1) Anemia, unexplained.

(2) Fever.

(3) Recent transfusion.

c. Positive Direct Coomb's Test.

d. Positive Indirect Coomb's Test.

6. REFERENCES FOR TRANSFUSION REACTIONS

a. Goldfinger D: Acute hemolytic transfusion reactions; Trans 17(2):85 97, 1977.

b. Ingram GIC: Bleeding complications of blood transfusion; Trans 5(1):1 5, 1965.

c. McCord RG, Myhre BA: Workup of febrile and allergic transfusion reaction; Lab Med 9(3):40 46, 1978.

d. Miller WV: Blood Group Immunology; Dade, pgs 125-134, 1976.

e. Pineda AA, et al: Hemolytic transfusion reactions; Mayo Cl Proc 53:378 390, 1978.

f. Pineda AA, et al: Delayed hemolytic transfusion reactions; Trans 18(1):1 7, 1978.

g. Young LE: Blood groups and transfusion reactions; Am J Med 16:878, 1954.

CLINICAL CHEMISTRY

1. GENERAL INFORMATION: The Chemistry Sections supporting Walter Reed Army Medical Center operate in two laboratories. The main laboratory is located in Building #2, New Medical Treatment Facility, WRAMC, Washington, D.C., and performs all routine chemistry procedures with the exception of selected tests, e.g. spinal fluid chemistries, which are performed in the Priority/ Chemistry Laboratory. All other tests are performed in the Medical Laboratory located in Building #2490, Fort Meade, Maryland.

2. HOURS OF OPERATION:

a. Main Laboratory, NMTF, Building #2:

(1) Parallel Area: Monday-Friday, 0645-1630 hours.

(2) Automated, semi-automated, and special chemistries: Monday-Friday, 0745-1630 hours.

(3) Therapeutic drug monitoring: Monday-Friday, 0745-2300, except holidays; Saturday/Sunday, 0930-1700.

(4) Priority Lab: 24 hours, 7 days a week.

b. Medical Laboratory, Fort Meade, Maryland:

Steroid and urinary metabolites and nuclear chemistry: Monday-Friday, 0730-1600 hours.

3. TELEPHONE NUMBERS:

a. Main Laboratory, NMTF, WRAMC:

(1)	Priority Chemistry	61920
(2)	Processing & Reports Information	61916
(3)	Parallel Area	61926
(4)	Other Technical Areas	61924
(5)	Therapeutic Drug Monitoring Area	61928
(6)	Chief, Chemistry	61927
(7)	Toxicology	61928

b. Medical Laboratory, Fort Meade:

(1)	Steroid and urinary metabolites, trace metals	AV 923-4090
(2)	Nuclear Chemistry	AV 923-2928/4090
(3)	Chief, Chemistry	AV 923-4090/4076

c. Medical personnel who desire early analytical results from the Medical Laboratory, Fort Meade, Maryland, and/or other information pertinent to specimen collection, are urged to dial Autovon 8-923-XXXX (Commercial (301) 677-XXXX). Autovon should be used whenever possible.

d. Courier Service, WRAMC and Fort Meade: Twice daily, Monday-Friday, except holidays, at 0900 and 1200 hours.

4. SERVICES AVAILABLE:

a. Main Laboratory, WRAMC: The Chemistry Section is divided into seven functional areas as follows: Processing, Automated Area, Parallel Area, Special Chemistry Area, Therapeutic Drug Monitoring Area, Priority Chemistry and Toxicology.

b. Processing: All routine serum specimens submitted for blood chemistry with the exception of Parallel requests are processed in this area (urine samples should be submitted to the Urinalysis Unit for proper preparation, urine volume, etc.). This unit will insure that sufficient aliquots are then made available for analysis in other areas of the Chemistry Section. Information can be obtained from this unit on Ext 61916.

c. Automated Lab: This area performs a variety of tests. Sample cutoff time is 1030 hours; 1230 hours for glucose and creatinine. All questions concerning the validity of results should be referred to Chief, Chemistry Section Ext 61927.

d. Parallel: The laboratory has an American Monitor Parallel Analyzer designed primarily for extensive patient profiling. A profile request will be assayed on the same day basis if the sample is received in the laboratory by 1030 hours. The results from such a requests will be available at the Record Room, Department of Pathology, by 1630 hours. Currently, this service is provided Monday through Friday. As stated above, this system is for routine profiling. Accordingly, stat requests are not honored. If, however, a special request is needed during the normal operation time (0645-1300), every effort will be made to accommodate the requestor if proper coordination is made with the Chief, Chemistry Section. Request for results of profile requests can be obtained from the TRILAB computer or the Pathology Record Room, Ext 61910, 61911, or 61912. Tables V and VI list respectively tests on the Parallel and their normal ranges.

e. Special Chemistry Area: This area handles a number of normal chemistry procedures such as Lithium, Magnesium, Lipase, etc. The cutoff time for procedures assigned to this area is 1030 hours. At the present time other procedres such as steroids, catecholamines, metabolites, vitamins, and thyroid studies, are performed at the Fort Meade Medical Laboratory facility (see para 6). Except for those tests performed daily, such as amniotic fluid analysis (O.D. scan, L/S ratio), allow a minimum of seven days for return of lab reports. Additional procedures not performed at either location are available through a commercial laboratory if there is sufficient justification. All such requests should be referred to the Chief, Chemistry Section, Ext 61926 or 61927.

f. Therapeutic Drug Monitoring and Toxicology: The TDM Section provides rapid turnaround time for patient drug levels which are accurate, precise, and specific for eight drug levels. The tests currently available as well as special instructions and type of specimen required are listed in Table I.

Specimens for therapeutic drug monitoring need only be accompanied by Therapeutic Drug Monitoring Form 633. Care must be taken to include 1) all drugs administered, and 2) post-administration time. Marked variations in drug levels occur following their ingestion if blood specimens are collected too early or late, thus making interpretation of reported-results difficult. Information can be obtained from this unit at Ext 61928. The Toxicology service currently uses thin layer chromatography to test for 12 drugs of abuse. Urine specimens submitted for drug screen will only be tested for the drugs listed in Table I. If a drug other than those listed is suspected, a request for that specific drug must accompany the specimen.

g. Chemistry Special Instructions: Specimen handling instructions can be obtained from the Chemistry Section and are particularly necessary in regard to samples to be sent to commercial laboratories. Appropriate phone numbers are: Ext 61916 (Chemistry Processing).

(1) Requests for laboratory results should be directed to the Pathology Record Room, Ext 61910, 61911, or 61912, only if results are not on the TRILAB computer system.

(2) Table I lists the routine chemistry procedures available, type of specimens and amount, normal range and instructions for collection.

5. MEDICAL LABORATORY, FORT MEADE:

a. The Chemistry Section consists of Special Chemistry (steroids, urinary metabolites, trace metals, amino acids and selected enzyme tests); Nuclear Chemistry (thyroid and pituitary hormones, vitamins such as Folate and B_{12}, steroid and other tumor and/or cancer markers). (See Tables II, III and IV).

b. All personnel responsible for instructing patients or for supervising collection of specimens (blood, urine or stool), are cautioned to follow the instructions listed below:

(1) Specific instructions for collecting and subsequent handling of specimens for selected hormone analysis must be adhered to in order to obtain analytical results. In most instances these specimens, if spun down within one or two hours post-collection, will be satisfactory.

(2) Accuracy of collection of urine specimens is most important for all quantitative analyses in which the results can be evaluated only on a 24-hour basis. The excretion patterns for most substances vary to such an extent that the failure to include an hour's urine or the inclusion of an extra hour's urine to the 24-hour volume may mean the difference between a normal and a pathological result. The patient should void and discard the initial urine, noting and recording the exact time on the request form. All the urine voided for the next 24 hours, including the last excretion at the same hour the collection was started the prior day, should be collected in a large chemically cleaned jug and kept in a refrigerator. The forwarding laboratory must accurately record the total volume on the request form and

submit an aliquot from the well-mixed total collection in the amounts given in Table II of this manual. When more than one test is required, a single aliquot may be submitted if no preservative is required. Polyethylene bottles are quite satisfactory for submitting specimens (FSN 6640-935-4064, 4069 and 4071).

(3) For specialized analysis of urine, all medications, including vitamins, should be discontinued at least 48 hours prior to the urine collection. When the results of such medications are to be evaluated by analysis of urine, the names and amounts of all the drugs given must be listed on the request form. Failure to list such medications will result in routine processing, and the results so obtained in many cases will be completely misleading because of cross-interference in the analysis.

(4) Accuracy in collection of fecal specimens is also of utmost importance to insure accurate results in the quantitative analysis performed. Because of variability of fecal output, it is recommended that this variation be averaged by pooling a three day collection. The collection of this feces should be representative of the ingested diet; therefore, the patient should be on a prescribed diet of known fat content per day and over a five day period. The collection should be made during the last three days of the diet. The three day collection should be made in a pre-weighed, widemouth container to facilitate stirring or mixing prior to removing a 50-100 gm representative sample for testing. The weight of the container plus the specimen, minus the weight of the empty collection container, is measured to obtain the actual weight of the specimen, and MUST BE RECORDED ON THE SLIP PRIOR TO SHIPMENT.

TABLE I

CLINICAL CHEMISTRY

Tests Performed at WRAMC Main Laboratory (NMTF)

ANALYSIS	SPECIMEN TYPE	REQUIRED QUANTITY	WHEN PERFORMED	NORMAL RANGE	INSTRUCTIONS & REQUEST SLIPS
Acetaminophen (Tylenol)	Serum	1.0 ml	Emerg as Req	Negative	Avoid hemolysis. Refrigerate until run (Form 633).
Amikacin	Serum	0.5 ml	Daily (pm)	Peak 20-25 ug/ml Toxic > 10 ug/ml	Avoid hemolysis. Refriferate until run (Form 633).
Amylase	Serum Urine	0.5 ml 50 ml	Daily Daily	16-106 IU/dl < 300 IU/dl	Avoid hemolysis. Refrigerate until run (Chem I SF 546 - Serum), (Chem III SF 543 - Urine).
Bilirubin	Serum	0.5 ml	Daily	Direct < 0.4 mg/dl Total 0.1-1.2 mg/dl	Avoid hemolysis. Protect from light (Chem I SF 546).
BSP	Serum	2.5 ml	Daily	4% or less @ 45 minutes	Patient given dye by physician. Dose is 5 mg/kg of BSP required. Patient's wt (lbs) / 22 = ml of % BSP (Misc SF 557)
Calcium	Urine	50 ml	Daily	50-400 mg/24 hrs	24 Hr collection. Refrigerate (Chem III SF 548 - Urine).
Carbamazepine (Tegretol)	Serum	0.5 ml	Twice Daily	8-12 mcg/ml Toxic > 15 mcg/ml	Avoid hemolysis. Refrigerate until run (Form 633).
Chloride	Urine	50 ml	Daily	170-254 meq/L	24 Hr collection. Refrigerate (Chem III SF 548 - Urine).
Cholesterol	Serum	0.5 ml	Wednesday	Male: 188-288 mg/dl Female: 117-260 mg/dl	Avoid hemolysis. Refrigerate until run (Misc SF 557).
CPK	Serum	0.5 ml	Daily	0-170 IU/L	Avoid hemolysis. Separate immediately and freeze. (Chem I SF 546).
CPK Isoenzyme	Serum	2 ml	Daily	0-10 IU/L or < 4% of total	Avoid hemolysis. Separate immediately and freeze (Misc SF 557).
Creatinine	Urine	50 ml	Daily	0.8-2.0 mg/24 hrs	24 Hr collection. Refrigerate (Chem III SF 548 - Urine).
Digoxin	Serum	0.5 ml	Daily	0.8-2.0 ng/ml Toxic > 2.0 ng/ml	Avoid hemolysis. Refrigerate until run (Form 633).

ANALYSIS	SPECIMEN TYPE	REQUIRED QUANTITY	WHEN PERFORMED	NORMAL RANGE	INSTRUCTIONS & REQUEST SLIPS
Ethosuximide (Zarontin)	Serum	0.5 ml	Daily (am)	40-100 mcg/ml Toxic > 150 mcg/ml	Avoid hemolysis. Refrigerate until run.
Gamma GT	Serum	0.5 ml	Tuesday	8-44 IU/L	Avoid hemolysis. Freeze until ready for run (Misc SF 557).
Gentamicin	Serum	0.5 ml	Daily(pm)	5-10 mcg/ml Toxic > 12 mcg/ml	Avoid hemolysis. Store Frozen until run (Form 633).
Glucose	Plasma Urine	0.5 ml 50 ml	Daily Daily	70-110 mg/dl < 0.5 gms/24 hrs	Collect fasting in oxalate-fluoride mixture. Mix well and remove plasma (Chem I SF 546). 24 Hr collection. Refrigerate (Chem III SF 548 - Urine).
HA_{1c} Glycosylated Hemoglobin	Lavender Top Whole Blood	7 ml	Daily	5.6-7.6%	Store in refrigerator @ 4°C. Hemolysates will be prepared in Lab and are stable for one week when stored at 4°C.
HDL Cholesterol	Serum	1.0 ml	Wednesday	Male: 26-63 mg/dl Female: 33-75 mg/dl	Avoid hemolysis. Refrigerate until run. (Misc SF 557)
Iron (Total)	Serum	1.5 ml	Daily	48-182 ug/dl	Avoid hemolysis. Use iron free tubes for collection. Shows diurnal variation lower in A.M. (Chem II SF 547).
Iron Binding Capacity (Total)	Serum	0.5 ml	Daily	269-450 ug/dl	Same as above for iron (Chem II SF 547).
Lactose Tolerance	Plasma	0.5 ml	Daily	Increase in glucose value of 25 mg/dl or greater	Prescription for Lactose must be written by the requesting physician and tubes marked at the interval drawn.
LDH	Serum	0.5 ml	Daily	26-186 IU/L	There is evidence to indicate that the isoenzymes of LDH are both stable and unstable at room temp (25°C), and the frozen state. If analysis cannot be performed at installation, separate serum from clot within 20 min of drawing. Avoid hemolysis. Ship immediately. DO NOT FREEZE. REFRIGERATE ONLY IF MUST BE KEPT OVER 5 DAYS (Chem I SF546).

ANALYSIS	SPECIMEN TYPE	REQUIRED QUANTITY	WHEN PERFORMED	NORMAL RANGE	INSTRUCTIONS & REQUEST SLIPS
LDH Isoenzyme-1	Serum	2 ml	Daily	<85 IU/L w/MB present <170 IU/L w/o MB pre	Same as LDH (Misc SF 557).
Lidocaine	Serum	0.5 ml	Daily	1.5-5.0 ug/ml Toxic > 10 ug/ml	Avoid hemolysis. Refrigerate until run (Form 633).
Lipase	Serum	0.5 ml	Wednesday	4-24 IU/dL	Avoid hemolysis. Stable when refrigerated. Ship immediately. (Chem I SF 546).
Lithium	Serum	1.0 ml	Daily	Therapuetic range 0.5-1.5 meq/L	Avoid hemolysis. (Misc SF 557)
Magnesium	Serum Urine	0.5 ml 50 ml	Daily Daily	1.7-2.9 mg/dl 3.0-6.1 mg/dl	Avoid hemolysis. 24 hr collection (acid washed plastic container). (Misc SF 557).
Methotrexate	Serum	1 ml	Daily	Depends on protocol	Scheduled with Hem Onc and received in TDM (Rm 2B51) NLT 1400 hrs (Form 633)
Osmolality	Serum Urine	0.5 ml 50 ml	Daily Daily	276-300 mOsmol/kg Varies with intake	Avoid hemolysis. 24 hr collection (acid washed plastic container). (Misc SF 557).
Phenobarbital	Serum	0.5 ml	Twice Daily	15-40 mcg/ml Toxic > 50 mcg/ml	Avoid hemolysis. Refrigerate until run (Form 633)
Phenytoin (Dilantin)	Serum	0.5 ml	Twice Daily	10-20 mcg/ml Toxic > 20 mcg/ml	Avoid hemolysis. Refrigerate until run (Form 633).
Phosphatase, acid	Serum	0.5 ml	Tuesday & Thursday	0.9-2.5 IU/L	Avoid hemolysis. Separate Serum and Freeze until run. (Misc SF 557)
Phosphorus	Urine	50 ml	Daily	0.34-1.0 gm/24 hrs	24 Hr collection. Refrigerate (Chem III SF 548 - Urine).
Potassium	Urine	50 ml	Daily	25-123 meq/24 hrs	24 Hr collection. Refrigerate (Chem III SF 548 - Urine).
Primidone (mysoline)	Serum	0.5 ml	Daily (am)	5-12 mcg/ml Toxic > 15 mcg/ml	Avoid hemolysis. Refrigerate until run (Form 633).
Procainamide/ NAPA	Serum	0.5 ml	Daily (pm)	Sum of PA+NAPA = 5-30 ug/ml	Avoid hemolysis. Refrigerate until run (Form 633).
Quinidine	Serum	0.5 ml	Daily	2-5 mcg/ml Toxic > 10 mcg/ml	Avoid hemolysis. Refrigerate until run (Form 633).
Parallel Profile	Serum	3.0 ml	Mon-Fri	See TABLE VI	Fasting sample (Misc SF 557).
Sodium	Urine	50 ml	Daily	43-217 meq/24 hrs	24 Hr collection. Refrigerate (Chem III SF 548 - Urine).

ANALYSIS	SPECIMEN TYPE	REQUIRED QUANTITY	WHEN PEFORMED	NORMAL RANGE	INSTRUCTIONS & REQUEST SLIPS
Theophylline	Serum	0.5 ml	Twice Daily	10-20 mcg/ml Toxic > 20 mcg/ml	Avoid hemolysis. Refriergate until run (Form 633).
Transaminase (SGOT)	Serum	0.5 ml	Daily	8-31 IU/L	Avoid hemolysis. Refrigerate until run (Chem I SF 546).
Transaminase (SGPT)	Serum	0.5 ml	Daily	5-42 IU/L	Avoid hemolysis. Refrigerate until run (Chem I SF 546).
Triglycerides	Serum	0.5 ml	Wednesday	23-167 Slight increase in upper limit with increasing age	Avoid hemolysis. Refrigerate until run. (Misc SF 557).
Tobramycin	Serum	0.5 ml	Daily(pm)	Peak 5-10 ug/ml Trough < 2 ug/ml	Avoid hemolysis. Serum sample should be frozen until analyzed (Form 633)
Toxilab (Drug Screen)	Urine	Small Amount	Daily	None detected for barbiturates, opiates, amphetamines, elavil, PCP, THC, cocaine, methaqualone, valium acetominophen	Misc SF 557
Trypsin	Feces	Small amount	Daily	Infant positive 1:100 dilution	Test must be performed fresh specimen within 24 hours of collection; otherwise ship frozen. (Misc SF 557).
Urea Nitrogen	Urine	50 ml	Daily	12-20 gm/24 hrs	24 Hr collection. Refrigerate (Chem III SF 548 - Urine).
Uric Acid	Urine	50 ml	Daily	250-750 mg/24 hrs	24 hr collection. Refrigerate (Chem III SF 548 - Urine).
Valporic Acid	Serum	0.5 ml	Daily (pm)	50-100 ug/ml	Avoid hemolysis. Refrigerate until run (Form 633)
Vancomycin	Serum	0.5 ml	Daily (pm)	Peak 30-40 ug/ml Trough < 10 ug/ml	Avoid hemolysis. Serum sample should be frozen until analyzed (Form 633).

TABLE II

CLINICAL CHEMISTRY TESTS PERFORMED AT FORT MEADE

ANALYSIS	SPECIMEN TYPE	REQUIRED QUANTITY	NORMAL RANGE	COLLECTION AND SHIPPING INSTRUCTIONS
Aldosterone	Serum	2 ml	Supine: 5-10 ng/l Upright: 9-34 ug/l (Low Salt Diet)	Separate from clot immediately, freeze and ship to arrive frozen. Note whether supine or upright specimen.
Amino Acids	Serum	5 ml	Screening by paper chromatography; quantitation by Ion-Exchange	Use no preservatime for serum. Ship immediately. SEND CLINICAL HISTORY TO INCLUDE AGE AND SEX.
	Urine 24 hr	100 ml aliquot	Forwarded with final report	Collect a 24 hr collection in a container. keep refrigerated between additions. Mix, measure total volume, and forward a 50-100 ml aliquot. Send clinical history to include the total 24 hr volume.
Amino Acid Nitrogen	Serum	2 ml	3.6-5.2 mg/dl	Use no preservative
Amino Acid Nitrogen (Alpha)	Urine 24 hr	50 ml	Age Range (mg/24hr) 0-3 mos 8-31 3 mo - 1 yr 12-46 1-2 yrs 12-71 3-4 yrs 24-98 5-6 yrs 27-125 7-9 yrs 75-229 10-adult 60-272 Adult 144-352	Refrigerate urine during 24 hr collection. Send a 50 ml aliquot. Record total 24 hr volume and age on clinical history.
Aminolevulinic Acid (Delta)	Urine 24 hr	50 ml	1.3-7 mg/24 hr 0.0-0.54 mg/dl	Collect urine in an amber bottle kept refrigerated and containing 10 ml of glacial acetic acid. The pH should be between 4.0 and 6.5 prior to shipment.

TABLE II			COLLECTION AND SHIPPING INSTRUCTIONS	
ANALYSIS	SPECIMEN TYPE	REQUIRED QUANTITY	NORMAL RANGE	INSTRUCTIONS
Aminolevulinic Acid (Delta) for Lead Exposure (Adult)	Random Urine	10 ml	0.0-0.54 mg/dl	Collect midmorning specimen. Maintain normal fluid intake. Add 1 ml acetic acid per 100 ml of urine.
Amniotic Fluid (OD scan) L/S ratio), Surfactant (Shake) tests	Liquor Amnii (Clear)	5-6 ml	Spectrophotometric analysis of bilirurinoid pigments; results in optical density units. Results will be called.	Fluid must be CLEAR and not contaiminated with blood. Shield from direct light and refrigerate. Ship immediately. Specimen must arrive within 48 hrs aspiration; otherwise SHIP FROZEN.
Ascorbic Acid (Vitamin C)	Plasma (Heparin or EDTA)	5 ml	0.5-1.5 mg/dl	Collect in heparin or EDTA tube during fasting state. Must reach this lab within 4 hrs when iced; otherwise, freeze immediately and ship frozen.
Bence-Jones Protein, Qual.	Random Urine	50 ml	Negative	
Calculi (Urinary)	Entire Calculus	--	Qualitative analysis. Appearance, size and substances found are reported.	Submit dry in a test tube or jar.
Carotenes (B-Carotene)	Serum	3 ml	50-220 micrograms/dl	FREEZE IMMEDIATELY AND SHIP FROZEN. PROTECT FROM LIGHT!
Catecholamines	Urine 24 hr	30 ml aliquot	0-130 ug/24 hr	Collect urine in bottle containing 30 ml concentrated HCL. Mix well. Send proper aliquot (pH less than 2.0). Record total 24 hr urine volume on request slip. Refrigerate. Values invalidated by methyldopa, quinine, quinidine, Aureomycin^{R}, tetracycline, formaldehyde, B-complex vitamins, Insuprel^{R}, epinephrine.
Cholinesterase, RBC	Whole blood EDTA	5 ml	0.55-0.87 pH unit/hr	Collect blood with EDTA anticoagulant (Lavender Vacutainer). Refrigerate until shipped. DO NOT FREEZE.
	Serum/ plasma	2 ml	0.53-1.36 pH unit/hr	Stable for 1 week at 0.5°C. SHIP IMMEDIATELY WITH WET ICE OR SHIP FROZEN.

TABLE II			COLLECTION AND SHIPPING INSTRUCTIONS	
ANALYSIS	SPECIMEN TYPE	REQUIRED QUANTITY	NORMAL RANGE	INSTRUCTIONS
Chondroitin sulfate	Urine Random	25 ml	Qualitative	Use no preservative. Refrigerate until shipped.
Chorionic gonadotropin, beta subunit	Serum	1 ml	Males: Less than 1.5 mIU/ml Non-pregnant females: Less than 1.5 mIU/ml Pregnancy: Wk of Gest — Range-MU/ML 1st Week 20- 40 2nd Week 30- 100 3rd Week 100- 10,000 4th Week 1,000- 10,000 2nd-3rd Mo. 10,000-100,000 2nd Trimes. 10,000- 30,000 3rd Trimes. 5,000- 15,000	Separate serum immediately after clotting. Freeze and ship to arrive frozen.
Copper	Serum	3 ml	70-150 ug/dl	Submit in acid washed (6N HCl), distilled water rinsed pyrex tube, or use unopened red topped vacutainer tube. Use all stainless steel needles.
	Urine 24 hr	100 ml aliquot	Less than 30 microgram/ 24 hr	Collect urine in a glass or plastic bottle previously rinsed with 6N HCl, followed by demineralized water.
Cortisol, urinary free	Urine 24 hr	25 ml aliquot	20-100 mcg/24 hrs	Record 24 hr volume on request slip and submit 25 ml aliquot. Refrigerate.
	Serum	1 ml	6-9 A.M.: 6-24 mcg/dl 4-8 P.M.: 3-24 mcg/dl Post suppression: Less than 3 mcg/dl. Post stimulation: 2-3 times basal	Separate serum from clot. Note time of collection (A.M. or P.M.) and whether suppression or stimulation tests were undertaken.
Creatine	Serum	4 ml	Male - 0.17-015 mg/dl Female - 0.30-0.93 mg/dl	Avoid hemolysis.
	Urine	25 ml	Male-Up to 150 mg/24 hr; Female-Up to 250 mg/24 hr	Collect under refrigeration. Mix urine thoroughly. Record 24 hr volume; send 25 ml aliquot.

TABLE II			COLLECTION AND SHIPPING INSTRUCTIONS	
ANALYSIS	SPECIMEN TYPE	REQUIRED QUANTITY	NORMAL RANGE	INSTRUCTIONS
Cystine, screen (Qual)	Random Urine	25 ml	Negative to trace	Add one-two drops of chloroform as preservative.
Cystine (Cysteine) (Quant)	Urine 24 hr	50 ml	Up to 100 mg/24 hr	Add 5 ml chloroform to bottle before collection. REFRIGERATE during collection. Record 24 hr volume.
Digoxin	Serum/ plasma	1 ml	Non-toxic (Therapeutic) 1.0-2.5 ug/ml 6 hrs Toxic: > 2.5 ug/ml	Separate serum or plasma immediately from cells or clot and freeze. Ship to arrive frozen. Specify time period after last administration of drug.
Estradiol	Serum	4 ml	Adult Males: 15-45 pg/ml Adult Females: Follicular: 20-100 pg/ml Midcycle peak: 100-560 pg/ml Luteal: 80-300 pg/ml Post menopausal: 0-40 pg/ml Prepubertal children: < 10 pg/ml	Separate serum immediately after clotting Freeze or refrigerate during shipment.
Estrogens, Total	Urine 24 hr	100 ml	Menstruation: 1-5 ug/24 hr Post menopause: 0-10 ug/24 hr Ovulation Peak: 10-65 ug/24 hr Luteal Max: 5-60 ug/24 hr Males: 0-20 ug/24 hr Pregnancy: Markedly increased at term approximately 30 mg/24 hr	USE NO PRESERVATIVES. Keep refrigerated. Measure and record total 24 hr volume. Specimen must be accompanied by clinical abstract. INDICATE IF PATIENT IS PREGNANT OR NOT.

TABLE II			COLLECTION AND SHIPPING INSTRUCTIONS	
ANALYSIS	SPECIMEN TYPE	REQUIRED QUANTITY	NORMAL RANGE	INSTRUCTIONS
Fat, Fecal, Total	Feces 72 hr	50 gm aliquot	< 4% of fat intake. 1-7 gm/day on normal diet.	Weigh container to be used for collection. After collection, weigh specimen and container. Subtract weight of container from total weight of 72 hr feces specimen. RECORD WEIGHT OF CONTAINER AND 72 HR FECES SPECIMEN ON REQUEST SLIP. MIX SPECIMEN THOROUGHLY to insure uniformity and forward a 50-100 gm sample in a closed plastic container.
Fluoride	Urine	50 ml	Approx 1 mg/liter	Collect in a clean plastic container.
Folate	Serum	2 ml	Normal: 2-14 ug/l	Immediately separate serum from clot and freeze. Ship to be received frozen.
Follicle Stimulating Hormone (FSH)	Serum	1 ml	Males: 4-20 mIU/ml Females: Follicular: 40-20 mIU/ml Midcycle Peak: 12-30 mIU/ml Luteal: 4-20 mIU/ml Post menopausal: 40-200 mIU/ml	Separate serum immediately after clotting. Freeze and ship to arrive frozen.
Gastrin	Serum Non-hemolyzed	1 ml	50-155 pg/ml (fasting) 80-170 pg/ml (post-prandial)	Separate serum immediately after clotting freeze. Ship to arrive frozen.
Glutamine	CSF	3 ml	5-19 mg/dl	Freeze immediately and ship to arrive frozen.
Hemoglobin	Plasma	2 ml	0-6 mg/dl	Collect in EDTA tube; separate plasma.
Homogentisic Acid Screen	Urine	25 ml	Negative by screening technique	Random urine.
Human Growth Hormone	Serum, non-hemolyzed	1 ml	Adults: Basal ng/ml or less. NOTE: Changes in serum HGH levels in response to insulin or glucose administration are the most accurate indices of pituitary function. Children 1 1/2 - 12 yrs mean 16.9 ng/ml.	Separate serum immediately after clotting and freeze. Ship to arrive frozen.

TABLE II	COLLECTION AND SHIPPING INSTRUCTIONS			
ANALYSIS	SPECIMEN TYPE	REQUIRED QUANTITY	NORMAL RANGE	INSTRUCTIONS
5-Hydroxy-Indole Acetic Acid (5HIAA) Quant	Urine	25 ml	Less than 8 mg/24 hrs	Diet should be free of bananas and drugs (as chlorpromazine) 48 hrs prior to collection. Add 3 ml Toluene and 25 ml glacial acetic acid to container before starting collection. Keep refrigerated and record 24 hr volume.
17-Hydroxy-cortico-steriods (Porter-Silber)	Urine 24 hr	50 ml	Male: 3.6-11.6 mg/24 hr Female: 3.0-7.5 mg/24 hr Children: Handbook of Pediatrics, 3d Ed., Lange Medical Publications. Values vary with age as follows: 0- 2 yrs 2- 4 mg/24/hrs 2- 6 yrs 3- 6 mg/24/hrs 6-10 yrs 6- 8 mg/24/hrs 10-24 yrs 8-10 mg/24/hrs	Use no preservative. Keep refrigerated during collection. Ship immediately after measuring and recording 24 hr volume.
Iodine	Urine 24 hr	25 ml aliquot	25 mg or less/100 ml	Collect in clean or new one gallon container.
Insulin	Serum plasma	1 ml	7-17 uU/ml (fasting)	Separate serum immediately after clotting and ship frozen.
17-Keto-steroid, Neutral	Urine 24 hr	50 ml	Male: 5-25 mg/24/hr Female: 5--5 mg/24/hr Children: Handbook of Pediatrics, Lange Med Pubs. Values vary with age. 0-14 days 1.5-2.5 mg/24 hrs 0- 3 yrs 0.0-0.5 mg/24 hrs 3- 6 yrs 0.0-2.0 mg/24 hrs 6- 8 yrs 0.7-4.8 mg/24 hrs BOYS / GIRLS 10-11 yrs 0.7- 6.0 / 0.7- 5.0 12-14 yrs 1.3-10.0 / 1.3- 8.5 14-16 yrs 2.5-13.0 / 2.5-11.0	USE NO PRESERVATIVE. SHIP IMMEDIATELY after measuring 24 hr volume and recording.

TABLE II			COLLECTION AND SHIPPING INSTRUCTIONS	
ANALYSIS	SPECIMEN TYPE	REQUIRED QUANTITY	NORMAL RANGE	INSTRUCTIONS
Lead	Blood EDTA	5 ml	Normal - < 40 ug/dl	
	Urine 24 hr	50 ml	Normal - < 80 ug/dl	
Lecithin/ Sphingo-myelin (L/S)	Amniotic fluid	8-10 ml	Mature lung (34-36 wks) > 2.5:1 ratio indicative of possible respiratory distress.	Avoid blood cells; if present, centrifuge immediately to obtain clear or slightly turbid solution.
Luteinizing Hormone (LH)	Serum	1 ml	Males: 4-20 mIU/ml Females: Follicular: 5-30 mIU/ml Ovulatory Peak: 40-100 mIU/ml Luteal: 2-20 mIU/ml Post menopausal: 40-200 mIU/ml	Separate serum immediately after clotting. Freeze and ship to arrive frozen.
Metanephrine	Urine 24 hr	50 ml	0.1-1.3 mg/24 hr	See 3-Methoxy-4-Mandelic Acid.
3-Methoxy-4-Hydroxy-Mandelic Acid (VMA)	Urine 24 hr	50 ml	< 8 mg/24 hr (w/o urine blank)	Diet must be free of bananas, coffee, tea, vanilla and drugs 48 hrs prior to and during collection. Add 25 ml of 6N HCl (1:1 dilution of concentrated HCl) to bottle before collection. Refrigerate urine during collection. If pH of urine is above 3 at end of collection add acid until pH is 1-2. Measure and record 24 hr volume.
Melanin	Random Urine	50 ml	Negative	
Mercury	Blood	5-7 ml EDTA	0-3 ug/dl	
	Urine 24 hr	100 ml	< 20 ug/l	Collect in clean plastic containers containing 1 gm potassium perchlorate or 3 ml dilute nitric acid (1:1 concentration acid/water).
Methemo-globin	Blood	1 ml	< 3% of total Hb	Collect in EDTA tube (lavender).

TABLE II			COLLECTION AND SHIPPING INSTRUCTIONS	
ANALYSIS	SPECIMEN TYPE	REQUIRED QUANTITY	NORMAL RANGE	INSTRUCTIONS
Methemalbumin	Plasma	1 ml	Negative	Avoid hemolysis.
5-Nucleotidase	Serum	2 ml	0.15 mu/ml	Avoid hemolysis. Freeze serum and ship in frozen state.
Oxalic Acid	Urine 24 hr	50 ml	< 40 mg/24 hr	Add 5 ml of concentrated HCl per liter of urine collected. Mix well before taking an aliquot. Keep refrigerated. Record 24 hr volume.
Parathyroid Hormone (PTH) (Includes calcium)	Serum	1 ml	0.7-2.0 ng/ml	COLLECT IN PRE-CHILLED TUBES. Place in ice-water containers. Separate serum immediately freeze, and ship with dry ice to arrive FROZEN.
Phenylalanine	Serum	2 ml	Up to 6 mg/dl the 1st week thereafter, 0.8-3.5 mg/dl	Submit 1 ml of serum to which has been added 3 mg of sodium fluoride, or freeze and ship frozen.
Porphrins:				For analysis of porphobilinogen, coporoporphyrin and uroporphyrin, 24 hr urine specimen should be collected and kept under REFRIGERATION IN A BROWN BOTTLE. Check pH, and adjust to 6-7 by adding either glacial acetic acid or sodium carbonate (powder). Stable for 1 week at 4°C or 1 month at -20°C. Record 24 hr volume. MIX WELL AND SEND ALIQUOTS IMMEDIATELY BY COURIER IN ICE, OR FREEZE THE ALIQUOT AND SHIP FROZEN.
Coproporphrins	Urine 24 hrs	100 ml	0-160- ug/24 hrs	
Porphobilinogen	Urine 24 hr	100 ml	Negative	
Uroporphyrin	Urine 24 hr	100 ml	0-26 ug/24 hr	
Protoporphyrin, Fecal	Feces 72 hr	50 gm	Copro - 400-100 ug/24 hr Uro - 10-40 ug/24 hr Proto - 0-300 ug/24 hr	Collect 72 hr feces. Mix well and ship 50 gm amount.
Pregnanediol	Urine 24 hr	100 ml	mg/24 hr: Children: 0.4-1.0; Male: 0.3-1.5; postmenopausal women: 0.2-1.0; menstruating females: follicular 2.5-1.0; Luteal approx. 5.0; Pregnancy; Elevation after 3 mos to as high as 100.	Use no preservative. Keep refrigerated during collection. (On infants, send entire 24 hr volume). Measure and record total 24 hr volume.

TABLE II			COLLECTION AND SHIPPING INSTRUCTIONS	
ANALYSIS	SPECIMEN TYPE	REQUIRED QUANTITY	NORMAL RANGE	INSTRUCTIONS
Pregnane-triol	Urine 24 hr	100 ml	mg/24 hr Children: < 0.5 Males and post-pausal women: 0.9-2.0 Menstruating Females: 0.1-3.0 Pregnancy: 1-4.0	Use no preservative. Keep refrigerated during collection. (On infants, send entire 24 hr volume.) Measure and record total 24 hr volume.
Proges-terone	Serum	1 ml	Males: 0.1-0.8 ng/ml Females: Follicular: 0.52-1.84 ng/ml Luteal: 5.76-27.56 ng/ml Normal Pregnancy: Over 25 ng/ml, increasing duration gestation	Separate serum immediately after clotting. Freeze and ship to arrive frozen.
Prolactin	Serum Frozen	1 ml	Males: 4-20 ng/ml Females: 5-25 ng/ml	Separate serum immediately. Freeze and ship to arrive frozen.
Protoporphyrin red cell	Blood	1 ml	0-60 ug/dl	Whole blood collected in EDTA tube.
Pseudo-choline-esterase	Serum/ plasma	1 ml	Cholinesterase Activity 4-8 Iu/ml Dibucaine Inhibition 75-90% Fluoride Inhibition 75-80%	Collect blood with anticoagulant (Lavender Vacutainer). Refrigerate until shipped. DO NOT FREEZE.
Testos-terone	Serum	1 ml	Males, Prepubertal: 0.1-0.2 ng/ml Adult: 3.0-10.0 ng/ml Females, Prepubertal: 0.1-0.2 ng/ml Follicular Phase: 0.2-0.8 ng/ml Luteal Phase: 0.2-0.8 ng/ml Post Menopausal: 0.08-0.35 ng/ml	Include age and sex on lab request form.

TABLE II			COLLECTION AND SHIPPING INSTRUCTIONS	
ANALYSIS	SPECIMEN TYPE	REQUIRED QUANTITY	NORMAL RANGE	INSTRUCTIONS
T-3 Uptake	Serum	3 ml	Hyperthyroid: Above 45% Euthyroid: 35-45% Hypothyroid: < 35%	FREEZE UNTIL SHIPMENT CAN BE MADE. SHIP FROZEN.
T-3 (Triiodothyronine) by RIA	Serum	1 ml	44.0-194 ng/dl	Non-hemolyzed specimen. FREEZE AND SHIP FROZEN.
Thyrotropic Stimulating Hormone (TSH)	Serum	1.0 ml	0.0-5.1 UIU/ml	Separate serum immediately after clotting; freeze and ship to arrive frozen.
Thyroxine (T-4)	Serum	3 ml	4.5-11.5 ug/dl	Non-hemolyzed specimen. FREEZE AND SHIP FROZEN.
Thyroxine, Free (index)	Serum	6 ml	1.75-4.60 ng/dl. Calculated from T-3 and T-4 values.	Non-hemolyzed specimen. FREEZE AND SHIP FROZEN.
Tyrosine	Serum	2 ml	0.8-1.30 mg/100 ml	Submit 1 ml of serum to which has been added 3 mg of sodium fluoride, or freeze and ship frozen.
Urobilinogen	urine 24 hr	2 hr voiding	0.5-3.5 E.U./24 hr	Collect in brown bottle containing 100 ml of petroleum ether and 5 grams of anhydrous sodium carbonate. Keep sampe away from bright light and refrigerate during collection.
	Urine 24 hr	50 ml		
	Feces 72 hr	Total amount	75-350 E.U./100 gms	Ship frozen in dry ice. The weight of the empty container (with cap) should be recorded on the request slip. Ship total 72 hr specimens in a tightly sealed tin can or jar.
Vitamin A	Serum	3 ml	20-120 ug/dl	FREEZE IMMEDIATELY AND SHIP FROZEN IN DRY ICE. PROTECT FROM LIGHT.
Vitamin B_{12}	Serum	2 ml	140-750 pg/ml	Separate serum immediately and refrigerate until shipped.
VMA	---	--	---	See 3-Methoxy-4-Hydroxy-Mandelic Acid.

TABLE II			COLLECTION AND SHIPPING INSTRUCTIONS	
ANALYSIS	SPECIMEN TYPE	REQUIRED QUANTITY	NORMAL RANGE	INSTRUCTIONS
Xylose Absorption	Urine 5 hr	Total amount	5.3-7.7 g/5 hr	Patient fasted for 8 hrs or more. Begin test early in A.M. After patient voids, administer 25 gms of D (+) Xylose dissolved in 250 ml water. Note the time of completion of ingestion. Give patient another 250 ml of water. Obtain blood specimen 2 hrs following ingestion of Xylose. Collect all urine passed in the 5 hr period following ingestion, including the voiding at the end of the 5th hour. Refrigerate urine during collection. Allow no food or water during the 5 hour period.
	Whole Blood (Oxalated)	3 ml	20-52 mg/dl (2 hr blood level)	
Zinc	Serum	2 ml	68-136 mg/dl	AVOID HEMOLYSIS.
	Urine 24 hr	50 ml aliquot	320-580 ug/dl	Collect in a plastic container. Avoid metal caps.

TABLE III
COLLECTION AND SHIPPING INSTRUCTIONS
TOXICOLOGY SERVICE

ANALYSIS	SPECIMEN REQUIRED TYPE	QUANTITY
AUTOPSY CASES for Toxicology Analysis: (Freeze immediately and ship in dry ice)	Brain	One quarter brain
	Liver	500 grams
	Kidney	One-half kidney
	Stomach contents	All available or specify portion of total
	Urine Blood (Oxalated)	All available Approximately 50 ml
	Lung	One lung
	Bile	All available
	Intestinal contents	Approximately 100 grams in specific cases
	Hair	5 grams in specific cases
	Bone	Approximately 200 grams in specific cases

COLLECTION AND SHIPPING INSTRUCTIONS

DD Form 1323 (Toxicology Examination Request and Report) must be completely executed in triplicate and accompany all specimens submitted for legal purposes for post-mortem autopsy toxicological examinations.

Toxicological specimens should be handled as legal evidence. The maintenance of continuous chain of custody and positive identification of samples are of great importance in supporting laboratory findings used as legal evidence. All jars and plastic bags should be labeled to indicate the type of specimen or tissue, name, rank, SSN, and the date specimen was collected.

NO CHEMICAL PRESERVATIVE OF ANY KIND SHOULD BE USED. Autopsy or medicolegal specimens should be frozen immediately in dry ice or in a freezer, and should be shipped with sufficient dry ice so that they will be frozen upon arrival at this laboratory.

Autopsy tissues should be submitted in chemically clean glass or plastic jars, or plastic bags, with each tissue in a separate jar or plastic bag. Allow sufficient air space for the expansion of the material during freezing. For blood and urine, use glass-stoppered bottles or new screw-capped jars as these are thick-walled and less apt to crack on freezing and shipping. All glassware used to ship autopsy specimens for toxicological examination should be thoroughly rinsed with tap water and distilled water and dried.

TABLE IV
TOXICOLOGY TESTS AND NORMAL VALUES

ANALYSIS	SPECIMEN TYPE	REQUIRED QUANTITY	COLLECTION AND SHIPPING INSTRUCTIONS NORMAL VALUE (NV), THERAPEUTIC (THER), OR TOXIC LEVEL (TL)	INSTRUCTIONS
Acetaminophen	Serum	4 ml	TL: > 40 ug/ml	Collection time 1/2-2 hr post.
Acetylprocainamide				See Procainamide
Alcohol (Ethanol)	Blood, Urine, Serum	5 ml	TL: > 300 mg/dl	Prepare venipuncture site with non-alcoholic preparation complete chain of custody when applicable.
Alkaloids	Urine	100 ml	Toxic limit varies for each type of drug.	DO NOT SEND BLOOD. Collect within 16 hours of adsorption of drug.
Amitriptyline	Serum	---	Ther: > 180 ng/ml TL: 1.9 ug/ml comatose; 3-15 ug/ml, death	Collected 6-12 hrs post. Steady state achieved in 7-14 days after fixed dosage. The demethylated metabolite (nortriptyline) should be no greater than 140 ng/ml. Specimen should be collected in plastic syringe, NOT VACUTAINER. Separate serum and ship in teflon screw cap tubes.
Amphetamine	Urine	100 ml	TL: > 0.4 mg/dl	
Arsenic	Urine Blood Nails Hair	100 ml 10 ml All hands and toes 500 mg	NV: Up to 200 ug/liter; 3.0-7.0 ug/dl 20-60 ug/100g	Urine is specimen of choice if symptoms are present. Urine, nails and hair are specimen of choice for chronic exposure.

TABLE IV			COLLECTION AND SHIPPING INSTRUCTIONS	
ANALYSIS	SPECIMEN TYPE	REQUIRED QUANTITY	NORMAL VALUE (NV), THERAPEUTIC (THER), OR TOXIC LEVEL (TL)	INSTRUCTIONS
Barbiturates	Serum	10 ml	Ther: Varies for each barbiturate TL: Varies for each barbiturate	Request specific barbiturate if known. In autopsy cases label heart blood separately.
Barbiturate Screen	Urine	100 ml		
Benzo-diazepines (Screen only)	Urine	100 ml	Ther: Varies with each benzodiazepine TL: Varies with each benzodiazepine	Reported as benzodiazepines positive or none detected.
Bismuth	Urine	100 ml		Bismuth salts are not very toxic and may be tolerated in fair amounts.
Bromide	Oxalated or EDTA Blood	10 ml	Ther: 1-2 mg/dl TL: > 50 mg/dl	
	Serum	4 ml		
Cadmium	Urine	50 ml aliquot of 24 hr urine	NV: < 0.1 mg/l	Send in plastic container
Caffeine	Serum	5.0 ml	NV: 3.0-6.0 ug/ml TL: Death at concentration of 15.8 mg/dl	Collection time: 1 to 1 1/2 hr post ingestion.
Carbamazepine (Tegretol)	Serum	1 ml	Ther: 4.0-8.0 ug/ml TL: > 15 ug/ml	Collection time: 6-10 hours. Avoid using plastic serum separation.
Carbon Monoxide	Oxalated, EDTA Blood	Capacity of vacutainer	NV: < 10% saturation TL: > 15% saturation	

TABLE IV			COLLECTION AND SHIPPING INSTRUCTIONS	
ANALYSIS	SPECIMEN TYPE	REQUIRED QUANTITY	NORAML VALUE (NV), THERAPEUTIC (THER), OR TOXIC LEVEL (TL)	INSTRUCTIONS
Chloral hydrate	Oxalated EDTA Blood	10 ml	Death can occur with blood levels of 100 ug/ml or ingestion of dose as low as 4 gm.	
	Gastric	All		
Chloram-phenicol	Serum	1 ml	Ther: 15-20 ug/ml TL: Pediatric: > 30 ug/ml	Collection time: 1-1/2 hr post ingestion; on new patients collect a pre-specimen prior to administration of drug.
Chlor-diazepoxide (Librium)	Serum	4.0 ml	Ther: 0.5-1.9 ug/ml TL: 3.0 ug/ml has caused coma	Collection time: 1-2 hours.
Cocaine	Urine	100 ml		Screen only; reported as positive or none detected.
Cyanide	Oxalated EDTA Plasma	4 ml	NV: up to 1.5 ug/dl TL: 20 ug/dl	
	Gastric	All		
Darvon (Propoxy-phene)	Serum (Quant)	5 ml	Ther: 0.24-0.75 ug/ml TL: > 0.2 mg/dl	Collection time: 2 hours post ingestion.
	Urine (Qual.)	100 ml		Submit urine specimen for screen.
Demerol (Meperi-dine)	Blood	10 ml	Ther: 0.33-1.0 ug/ml TL: > 5.0 ug/ml	Collection time: 1-2 hours post ingestion.
Despira-mine (Norpra-min)	Serum	5 ml	Ther: > 180 ng/ml TL: 0.1 mg/dl	Collection time: 6-12 hrs post ingestion. Steady state established within 7-14 days with fixed dosage. Specimen should be collected in plastic syringe - not vacutainer. Separate and ship serum in teflon-lined screw top tubes.
Diazepam (Valium)	Urine Serum	100 ml 10 ml	Ther: 0.2-0.8 ug/dl TL: 3.0-14.0 ug/ml compatible with coma.	Collection time: 1 hour post ingestion. 1 mg/dl has caused coma.

TABLE IV			COLLECTION AND SHIPPING INSTRUCTIONS	
ANALYSIS	SPECIMEN TYPE	REQUIRED QUANTITY	NORMAL VALUE (NV), THERAPEUTIC (THER), OR TOXIC LEVEL (TL)	INSTRUCTIONS
Dilantin (Phenytoin)	Serum	2.0 ml	Ther: 10-20 ug/ml (adult) 5-20 ug/ml (child) TL: > 25.0 ug/ml	Collection time: 2 hrs post ingestion. Steady state established in 5-7 days with fixed dose
Diphenydramine (Benadryl)	Blood Urine	10 ml 100 ml	NV: 0.1 mg/dl	
Disopyramide (Norpace)	Serum	3.0 ml	Ther: 2-5 ng/ml TL: > 7 ng/ml	
Diuretics	Urine	100 ml	Ther: Varies with each drug TL: Varies with each drug	Collection time: 6 hours post dose.
Doriden (Gluthemide)	Serum	5 ml	Ther: 2-7 ug/ml TL: > 10 ug/ml	Deep coma and death with concentration of 25 ug/ml or higher.
Doxepin	Serum	5 ml	Ther: Optimal response with metabolite level 125 ng/ml TL: 1.0 mg/dl	Specimen should be collected in plastic syringe - not vacutainer. Separate and ship serum in teflon-lined screw cap tubes.
Elavil (See Amitriptylene)				
Equanil (Meprobamate)	Serum	5 ml	Ther: 18-27 ug/ml TL: > 50 ug/ml	Collection time: 2 hrs post.
Ethchlorvynol (Placidyl)	Serum	5 ml	Ther: 1-2 mg/dl TL: > 5 mg/dl	Collection time: 1-2 hrs post ingestion. Deep coma at 36 ug/ml.
Ethosuximide (Zarontin)	Serum	2 ml	Ther: 50-100 ug/ml TL: > 150 ug/ml	Collection time: 2-3 hrs post ingestion.
Gluthemide (Doriden)	Serum	5 ml	Ther: 2-7 ug/ml TL: > 10 ug/ml	Deep coma and death with concentration of 25 ug/ml or higher.
Halothan	Blood	5 ml	Ther: 1.03-1.6 mg/dl	Collection time: 30 minutes post.
Heavy Metal Screen	Urine	100 ml	TL: Varies with metal	Collection time: First morning void. Performed on all arsenic requests.

TABLE IV			COLLECTION AND SHIPPING INSTRUCTIONS	
ANALYSIS	SPECIMEN TYPE	REQUIRED QUANTITY	NORMAL VALUE (NV), THERAPEUTIC (THER), OR TOXIC LEVEL (TL)	INSTRUCTIONS
Imipramine (Tofranil) (See Desipramine)			Ther: > 180 ng/ml total (Imipramine and Desimpramine)	Collect as for Desimpramine
Isopropanol	Blood	5 ml	TL: > 150 mg/dl	Cleanse venipunture site with nonalcoholic solution. Complete chain of custody when applicable.
Librium (Chlorodiazepoxide)	Serum Urine	5 ml 100 ml	Ther: 0.4-1.3 ug/ml TL: > 1.0 ug/ml	Collection time: 2-4 hrs post ingestion. Included in urine drug screen. Reported as positive for benzodiasepines or none detected.
Lidocaine	Serum		Ther: 0.1-0.6 mg/dl	
Meperidine (Demerol)	Blood	10 ml	Ther: 0.33-1.0 ug/ml TL: > 5.0 ug/ml	Collection time: 1-2 hours post ingestion.
Meprobamate (Equanil)	Serum	5 ml	Ther: 18-27 ug/ml TL: > 50 ug/ml	Collection time: 2 hrs post.
Methadone	Urine	100 ml	NV: < 5 mg/dl	
Methampheta-mine	Urine	100 ml		Collection time: 4-6 hrs post. In large dose may be excreted in urine up to 7 days. Included in urine drug screen. reported as positive or none detected.
Methanol	Blood	5 ml	TL: > 50 mg/dl	Cleanse venipuncture site with nonalcoholic solution. Complete chain of custody when applicable.
Methaqualone (Quaalude)	Serum Urine	5 ml 100 ml	Ther: 0.2-0.3 mg/dl TL: > 0.8 mg/dl	Included in urine drug screen; reported as positive or none detected.
Methylprylon (Noludar)	Blood Urine	10 ml 100 ml	NV: < 1 mg/dl TL: > 4 mg/dl	Collection time: 2 hrs post dose.
Morphine	Urine	100 ml	TL: < 10 ug/dl	

TABLE IV			COLLECTION AND SHIPPING INSTRUCTIONS	
ANALYSIS	SPECIMEN TYPE	REQUIRED QUANTITY	NORMAL VALUE (NV), THERAPEUTIC (THER), OR TOXIC LEVEL (TL)	INSTRUCTIONS
Mysoline (Primidone)	Serum	1 ml	Ther: 5-12 ug/ml TL: > 15 ug/ml	Collection time: 2-4 hrs post. Steady state established in 2-3 days with fixed dosage.
Opiate Screen	Urine	100 ml		Opiate screen consists of morphine, and metabolite. Reported as either positive or none detected.
Phencyclidine (PCP)	Serum Urine	5 ml 100 ml	NV: None TL: 0.2 ug/ml	
Phenobarbital	Serum	1 ml	Ther: 15-40 ug/dl TL: > 50 ug/ml	Collection Time: 6-12 hrs post dose. Steady state in 14-21 days with fixed dose.
Phenol	Urine	100 ml	NV: 2-40 mg/l	
Phenothiazines	Urine	100 ml	NV: Varies for each drug TL: Varies for each drug	Included in urine drug screen; reported as positive or none detected.
Phenytoin (Dilantin)	Serum	2.0 ml	Ther: 10-20 ug/ml (adult) 5-20 ug/ml (child) TL: > 25.0 ug/ml	Collection time: 2 hrs post ingestion Steady state established in 5-7 days with fixed dose
Primidone (Mysoline)	Serum	1 ml	Ther: 5-12 ug/ml TL: > 15 ug/ml	Collection time: 2-4 hrs post. Steady state established in 2-3 days with fixed dosage.
Procainamide	Serum	1 ml	Ther: 4-8 ug/ml TL: > 16 ug/ml	Acetyl-procainamide also analyzed and quantitated.
Propoxyphene (Darvon)	Serum (Quant)	5 ml	Ther: 0.24-0.75 ug/ml TL: > 0.2 mg/dl	Collection time: 2 hrs post ingestion.
	Urine (Qual)	100 ml		Submit urine specimen for screen
Protriptyline (Vivactal)	Serum	5 ml	Therapeutic range not available	Collect as for Amitriptyline

TABLE IV			COLLECTION AND SHIPPING INSTRUCTIONS	
ANALYSIS	SPECIMEN TYPE	REQUIRED QUANTITY	NORMAL VALUE (NV), THERAPEUTIC (THER), OR TOXIC LEVEL (TL)	INSTRUCTIONS
Quaalude (Methaqualone)	Serum Urine	5 ml 100 ml	Ther: 0.2-0.3 mg/dl TL: > 0.8 mg/dl	Included in urine drug screen; reported as positive or none detected.
Quinidine	Blood	10 ml	Ther: 3-10 mg/l TL: > 10 mg/l	Collecting time: 3 hr post dose.
Salicylates	Serum	2 ml	NV: 5-15 mg/dl TL: > 20 mg/dl	Collecting time: 2 hrs post ingestion Tinnitus may be observed with levels of 20 mg/ml.
Screen Urine Drug	Urine	100 ml		Urine is screened for opiates, barbiturates, amphetamines, cocaine, methadone, darvon, benzodiazepines, methaqualone, pheonthiazines, and salicylates. Reported as positive for particular drugs or none detected.
Talwin (Pentazoocine)	Serum	5 ml	NV: 12 ug/ml	Collection time: 1-2 hrs post dose. Levels of 3-4 ug/ml have caused death.
Theophylline (Aminophylline)	Serum	1 ml	Ther: 10-20 ug/ml TL: > 20 ug/ml	Collecting time: 2-4 hrs post dose. Patient should be on diet free of coffee, tea, chocolate or cocoa at least 16 hrs prior to drawing sample.
Thiocyanate	Serum Urine 24 hr	2 ml 100 ml aliquot	Ther: 5-10 mg/dl NV: 0.2 mg/dl (non-smokers) up to 3.0 mg/dl (smokers)	
Thioridazine (Mellaril)	Serum Urine	5 ml 100 ml	TL: > 0.25 mg/dl	
Valium 'Diazepam)	Urine Serum	100 ml 10 ml	Ther: 0.2-0.8 ug/dl TL: 3.0-14.0 ug/ml compatible with coma.	Collection time: 1 hr post ingestion. 1 mg/dl has caused coma.
Valproate (Depakene)	Serum	2 ml	Ther: 50-100 ug/ml TL: not yet established	Collecting time: 2 hrs post dose.

TABLE V

WRAMC PROFILES

PROFILE 1:	Glucose
	BUN
	Creatinine
	Sodium
	Potassium
	Chloride
	Carbon Dioxide
PROFILE 2:	Calcium
	Phosphorus
	Total Protein
	Albumin
PROFILE 3:	Total & Direct Bilirubin
	SGPT (ALT)
	SGOT (AST)
	Alkaline Phosphatase

TABLE VI

PARALLEL PROFILE NORMAL VALUES

Albumin	3.0 - 5.1 g/dl
Alkaline Phosphatase	36 - 125 U/L
BUN	8 - 24 mg/dl
Calcium	8.9 - 10.4 mg/dl
Chloride	98 - 106 mEq/L
Cholesterol	107 - 269 mg/dl
CO_2	20 - 30 mEq/L
Creatinine	0.7 - 1.5 mg/dl
Direct Bilirubin	0.0 - 0.5 mg/dl
Glucose	76 - 115 mg/dl
LDH	94 - 181 U/L
Phosphorus	2.3 - 4.3 mg/dl
Potassium	3.6 - 5.3 mEq/L
SGOT (AST)	11 - 55 U/L
SGPT (ALT)	2 - 50 U/L
Sodium	137 - 144 mEq/L
Total Bilirubin	0.3 - 1.4 mg/dl
Total Protein	6.0 - 8.5 g/L
Triglyceride	47 - 175 mg/dl
Uric Acid	3.5 - 7.6 mg/dl

CLINICAL MICROSCOPY

1. GENERAL INFORMATION

a. The Clinical Microscopy Section is located in the 2-B Area, Room 2B41, and 2B36. The section performs hematology, urinalysis, coagulation and body fluid examination with two levels of turnaround time service. A limited menu of tests is offered, 24 hours a day, 7 days a week, in the Priority Lab (see Table II); turnaround time is guaranteed not to exceed 4 hours. Routine clinical microscopy, which operates 0745-1630 hours during normal duty hours, generally returns results within 8 to 24 hours, except for specialized tests which are referred to outside laboratories. Contributors are enjoined not to request Priority Lab service unless short turnaround time is essential to patient management. Clinical microscopy tests not on the Priority Lab menu are not available outside normal duty hours unless special arrangements are made with the Clinical Pathology Officer of the Day.

b. CBCs ordered by checking the CBC box will not include the differential count unless the white count is below 4,500 or greater than 10,000. If a differential is desired, the words "DIFF PLEASE" should be written out conspicuously as near the head of the order slip as possible.

c. With a full lavender top vacutainer, CBC, sedimentation rate, platelet count, and reticulocyte count can be performed; with a full blue top vacutainer, PT, PTT, TT and fibrinogen can be performed.

d. Bone marrow interpretation is performed by pathology staff and residents. The pathologists' office is located in Room 2B38 (576-1902/3).

e. For laboratory tests performed in Routine Clinical Microscopy, see Table I. Priority Laboratory procedures available are listed in Table II.

f. Semen analysis is performed in Routine Clinical Microscopy on Tuesday, Wednesday and Thursday mornings between 0800 and 1000 hours. Tuesdays are reserved for patients being evaluated in the Infertility Clinic; other patients can be tested on Wednesdays and Thursdays. The patient should abstain from any kind of sexual activity for 48 hours prior to collecting the specimen. Full patient instructions are available in the Infertility, OB and Urology Clinics, and in Room 2B34 of the laboratory on MED LAB, Dept of Path (WRAMC) Form 2 (Jun 84).

g. All problems or complaints should be directed to the Laboratory Supervisor (576-1043), or to the Medical Director (576-1902/3).

2. BODY FLUID EXAMINATION

a. Samples of cerebrospinal, pleural, pericardial, peritoneal, and synovial fluid will be accepted. A minimum volume of 1.0 ml is required. Services are available Monday through Friday, from 0745 - 1530 hours.

b. Specimens should be accompanied by a SF 555 (Spinal Fluid) or SF 557 (Miscellaneous) form. On all specimens a cytospin slide (see below) is made

and stored for two weeks. Cell counts are performed on a manual chamber; differentials are performed on the cytospin and reported as % polys and % mononuclears only. For further morphologic description of cells, see cytospin below.

c. The specimen should not be mixed with fixative of any kind. Cerebrospinal fluid should not be mixed with anticoagulant. Synovial, pleural, pericardial, and peritoneal fluid should be in EDTA (lavender vacutainer) to avoid clotting. All specimens should be brought to the laboratory immediately following removal from the patient to avoid degeneration of cellular elements and, in the case of synovial fluid, to expedite examination prior to possible clot formation.

d. Cytospin:

A cytospin is a technique by which the cells in a relatively large volume of fluid, (600-700 mm^3) can be concentrated on a small area of a slide for morphologic observation. These cells will be reviewed by a pathologist upon request: A SF 515, Tissue Examination form, specifying "cytospin" and including pertinent clinical history, must be submitted. Turnaround time is generally under 24 hours. The cytospin can thus serve as a rapid screening procedure for the presence of malignant or other abnormal cells in body fluids. Because of technical artifacts, however, this procedure is less definitive than conventional cytology as performed by Anatomic Pathology. It is recommended, therefore, that fluids not be submitted for cytospin examination except under one of the following conditions:

(1) The disease in question is hematopoietic (e.g., leukemia)

(2) There is sufficient quantity of fluid to send a separate specimen to Cytology (submission instructions for Cytology are listed in Anatomic Pathology portion of the manual).

e. The following tests will be performed:

Fluid	Test	Normal Range & Comment
Cerebrospinal	Color	Colorless
	Cell Count	0-5 mononuclear cells/mm^3 (0-30 neonate)
	% polys	2% $\pm$ 5 (3% $\pm$ 5 neonate); performed on cytospin
	Cytospin examination	interpreted by pathologist
Pleural	Color	Colorless to pale yellow
	Cell count & differential (% polys)	
	Cytospin examination	interpreted by pathologist

Fluid	Test	Normal Range & Comment
Pericardial	Color	pale yellow
	Cell count & differential (% polys)	
	Cytospin examination	interpreted by pathologist
Peritoneal	Color	pale yellow
	Cell count & differential (% polys)	
	Cytospin examiantion	interpreted by pathologist
Synovial	Color	Colorless to pale yellow
	Transparency	Crystal clear
	Cell count & differential (% polys)	
	Crystal polarization	for detection uric acid or Calcium pyrophosphate crystals
	Cytospin examination	interpreted by pathologist

3. URINALYSIS CLINICAL MICROSCOPY

a. Routine urinalysis consist of the following tests: color, appearance, pH, specific gravity, sugar, protein, acetone, blood, bile if requested, and microscopic examination of the urinary sediment.

b. Request slips: SF 550 - Routine UA and pregnancy test
SF 548 - Chem III urine
SF 548 - 24 hour sample

c. Sample requirement:

(1) Routine - first morning void.

(2) 24 Hour Specimen - the bladder must be emptied and this specimen discarded at time the 24 hour collection is to start. Collect the urine on a weekend or whenever you are sure all specimen can be saved. Keep sample refrigerated until transported to laboratory, Monday through Friday, 0600 - 1630 hours.

Test	Sample	Lab Hours	Range & Comment
Color of urine	Urine	0745-1600 hours Mon-Fri	Normal (Yellow to amber)
Clarity of urine	Urine	0745-1600 hrs Mon-Fri	Clear to Transparent
pH	Urine	0745-1600 hrs Mon-Fri	4.5-8.0 sample must be fresh. Standing may cause alkaline urine due to bacteria breakdown

Test	Sample	Lab Hours	Range & Comment
Specific Gravity	Urine	0745-1600 hrs Mon-Fri	1.003-1.030
Microscopic	Freshly voided sample	0745-1600 hrs Mon-Fri	
2 Hr. pregnancy Test	First urine voided after arising in the morning	0745-1400 hrs Mon-Fri	Negative
Melanin	Urine	0745-1600 hrs	Negative-Screening Test only
Porpho - + Urobilinogen	Urine	0745-1600 hrs	Negative-Screening Test only
Hemosiderin	Urine	0745-1600 hrs	Negative-Screening Test only
Refractile fat	Urine	0745-1600 hrs	Negative-Screening Test only
Myoglobin	Urine	0745-1530	Negative-Screening Test only

TABLE I
CLINICAL MICROSCOPY ROUTINE STUDIES

TEST	SAMPLE	HOURS	RANGE	COMMENT
Acidified Serum Lysis Test	Drawn in lab (defibrinated blood)	Schedule by calling 576-1041		For paraoxysomal nocturnal hemoglobinuria: Not performed unless sucrose Hemolysis Test Positive (except for diagnosis of HEMPAS).
Autohemolysis Test	Drawn in lab (defibrinated blood)	Schedule by calling 576-1041, 0745-1300 hrs, Mon-Wed	Normal/abnormal	Screen for hereditary spherocytosis and RBC enzyme deficiencies.
CBC (automated) includes WBC, RBC, Hgb, Hct, MCV, MCH, MCHC, platelet count	Lavender vacutainer - minimum draw 5 cc	0745-1630 hrs Mon-Fri	WBC - M 7.8 ± 3 F 7.8 ± 3 RBC - M 5.4 ± 0.7 F 4.8 ± 0.6 Hgb - M 16.0 ± 2.0 F 14.0 ± 2.0 Hct - M 47 ± 5 F 42 ± 5 MCV - M 87 ± 7 F 90 ± 9 MCH - M 29 ± 2 F 29 ± 2 Platelet - 174-430	Hematology - Geometric Data
Chromosome Studies	Bone marrow or Peripheral Blood	Specimen must reach lab by 1130 hours	Interpreted by Cytogeneticist	Performed by AFIP Cytogenetics Lab. Do not draw or send sample without prior approval from Pathologist (576-1902). Must be accompanied by Consult Form 513 or Tissue Examination Form 515. Patient's age and sex must be included.

TEST	SAMPLE	HOURS	RANGE	COMMENT
Cytochemical stains	Heparin or EDTA anticoagulatant	0745-1430 hrs		
1. Nonspecific esterase				Enzymatic activity is seen as dark red granules, mainly in cytoplasm of monocytes, histiocytes and megakaryocytes.
2. Leder (Chloroacetate esterase)				Chloracetate esterase activity seen as bright red granules in cytoplasm of mast cells and neutrophilic granulocytes including promyelocytes and many myeloblasts.
3. Peroxidase				Peroxidase activity is seen as blue granules in neutrophilic granulocytes including promyelocytes and many myeloblasts, eosinophils and monocytes. Basophils may show mild peroxidase activity.
4. Combined chloracetate esterase and nonspecific esterase				These esterase reactions have proved of value in distinguishing acute myeloid leukemia, acute myelomonocytic leukemia, and acute monocytic leukemia and in helping to distinguish precursors of granulocytes and monocytes in poorly differentiated leukemias.
5. Acid phosphatase, with and without tartrate				Unipolar positivity occasional in lymphoid cells (especially T-lymphocytes); in hairy cell leukemia, activity is resistant to tartrate digestion.
6. Periodic Acid-Schiff	EDTA			PAS positive cells will stain pink-to-red while PAS negative cells do not stain pink or red. Abnormal PAS staining is found in acute lymphocytic leukemia, and erythroleukemia

TEST	SAMPLE	HOURS	RANGE	COMMENT
Eosinophil Count	Lavender vacutainer	0745-1530 hrs	150-300/mm^3	Sample should be brought to lab as soon as possible.
Factor Assays	Blue vacutainer (4.5 cc)	0745-1300 hrs Mon-Thurs only	50-150%	Obtained from WRAIR Coag Lab. Prior coordination of pathology required.
Fibrin Split Products	Tubes are supplied by lab (2 cc blood)	0745-1530 hrs Mon-Fri	<10 ug/ml	Sample must be taken to lab as soon as drawn and run within 1/2 hour of drawing. If not, results are not valid.
Fibrinogen - chemical assay	Blue Vacutainer	0745-1530 hrs Mon-Fri	113-380 mg/dl	Must specify chemical assay. A normal level by chemical assay in the face of a decreased level by Functional Test is suggestive of a dysfibrinogenemia.
Fibrinogen - Functional assay	Blue Vacutainer	0745-1530 hrs Mon-Fri	132-364 mg/dl	Modified thrombin time. A simple quantitative assay for fibrinogen by measuring the clotting time of diluted plasma when thrombin is added. The clotting time obtained is then compared with that of a standardized fibrinogen preparation.
G6PD Screen	Blood collected in heparin; ACD or EDTA anti-coagulant is satisfactory	0745-1600 hrs	Negative	More definitive test required if test is positive. Test is not valid in patients with active hemolysis.
Heinz body stain	Lavender vacutainer	0745-1500 hrs	Negative	Represents denatured precipitated hemoglobin. May be seen in certain hemoglobinopathies as well as in G6PD deficiency.
Hemoglobin, plasma	Drawn in heparinized syringe. Cap needle and bring to lab immediately	0745-1430 hrs	0-5.0 mg%	Performed as test for hemolytic anemia. In hemolysis the plasma hemoglobin is elevated.
Kleihauer stain for fetal hemoglobin	Fresh - lavender top	0745-1530 hrs	Negative	To detect fetal red blood cells in mother's blood or to detect HPFH

TEST	SAMPLE	HOURS	RANGE	COMMENT
Leukocyte alkaline phosphatase	Green vacutainer	0745-1530 hrs	13-130	Useful in evaluation of myeloproliferative disorders.
Morphology and WBC Differential	Lavender vacutainer	0745-1530 hrs Mon-Fri		Differential not performed Routinely. See General Information, para 1b.
Osmotic RBC Fragility (Quant.)	Heparinized blood, 10 ml green top vacutainer	0745-1430 hrs Mon-Thurs only Must be scheduled.		
Partial Thromboplastin time	Blue vacutainer (4.5 cc)	0745-1530 hrs Mon-Fri	27-39 sec	All coagulation specimens must be in a full blue top vacutainer for correct anticoagulant/blood ratio. Care should be taken to avoid hemolysis.
Platelet Count	Lavender vacutainer or platelet unopette	0745-1530 hrs Mon-Fri	174-430,000	Avoid use of Pediatric vacutainer and bullet tubes when possible, as platelet clumping is enhanced with these tubes.
Platelet Estimate	Lavender vacutainer or acceptable peripheral smear	0745-1530 hrs Mon-Fri	12-30/Oil immersion fluid	Estimates are reported if the automated count and estimate do not agree.
Prothrombin Time	Blue vacutainer (4.5 cc)	0745-1530 hrs Mon-Fri	10-13 sec	All coagulation specimens must be in a full blue top vacutainer for correct anticoagulant/blood ratio. Care should be taken to avoid hemolysis.
Prussian stain for storage iron	1-Unfixed air-dried bone marrow or peripheral blood smears. 2-Smears previously stained with Wright's stain. 3-Smears previously stained with new methylene Blue N for reticulocytes.	0745-1530 hrs Mon-Fri		Normally granules will be found in in 10-60% of normoblasts in the bone marrow.

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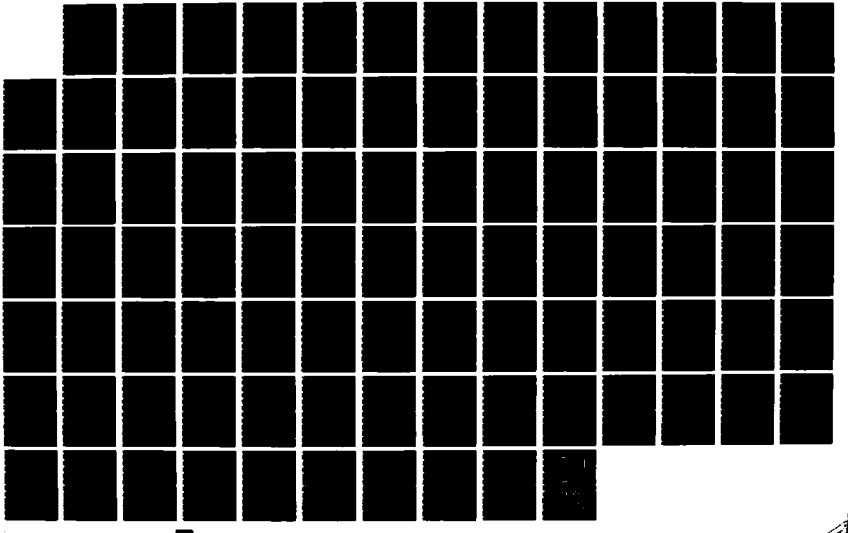

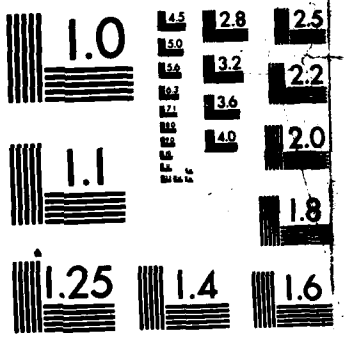

TEST	SAMPLE	HOURS	RANGE	COMMENT
Reptilase	Blue vacutainer (4.5 cc)	0745-1530 hrs	18-22 sec	Performed only if Thrombin time elevated. Reptilase activates fibrinogen directly. Prolonged with hypo/dysfibrinogenemia, but, unlike Thrombin, not affected by Heparin.
Reticulocyte Count	Lavender vacutainer	0745-1530 hrs Mon-Fri	0.5-1.5%	
Sedimentation Rate	Lavender vacutainer	0745-1530 hrs Mon-Fri	0-10 M 0-20 F	
Semen analysis	Freshly collected ejaculate	0800-1000 hrs Tues, Wed, Thurs	Sperm count 20-200 million/ml motility 1+ - 4+ morphology 80-90% normal forms	See Med Lab, Dept of Path (WRAMC) Form 2 (Jun 84) for complete instructions.
Sickledex	Lavender vacutainer	0745-1530 hrs Mon-Fri	Negative	Positive tests are forwarded for hemoglobin electrophoresis.
Sucrose Hemolysis (Sugar Water)	Blue vacutainer	0745-1600 hrs Mon-Fri	Negative	
Thrombin Time	Blue vacutainer (4.5 cc)	0745-1530 hrs Mon-Fri	± 1 sec. from thrombin time control	All coagulation specimens must be in a full blue top vacutainer for correct anticoagulant/blood ratio. Care should be taken to avoid hemolysis.

TABLE II

CLINICAL MICROSCOPY TESTS AVAILABLE IN PRIORITY LABORATORY

On whole blood (EDTA - purple top tube)

CBC: Hematocrit
Hemoglobin
Platelet count
WBC count
WBC differential (under 4,000 or over 10,000)
S-Hemoglobin screen

On plasma (sodium citrate - blue top)

Activated Partial Thromboplastin Time
Prothrombin Time
Thrombin Time
Fibrinogen
*Correction studies
**Fibrin degradation products

On urine

Urinalysis with microscopic examination
Pregnancy test

On sterile body fluids, including CSF

Cell count
Differential

*Requires pathologist consultation/approval

**Requires pathologist consultation; specimen must be drawn in special tube supplied by lab

MICROBIOLOGY

1. GENERAL INFORMATION

a. Location: Procedures are performed for Walter Reed Army Medical Center at two sites: the Microbiology Section in the new Medical Treatment Facility which handles the majority of the procedure testing, and the Microbiology Section, Department of Pathology and Area Laboratory Services, Fort Meade, Maryland, which provides serology procedures.

b. Hours and Staffing: The Microbiology Section, WRAMC, is staffed daily between 0600-2300 hours. During this time a full range of services are available. The remaining time (2300-0600), the Microbiology Section will provide a gram stain lab (Room 2B16) for the house staff and will accept body fluids, blood cultures and sputa to be processed at 0600 hours. On Saturday, Sunday and holidays during the day (0600-2300) a skeleton crew is available to initiate new specimens and perform critical time-dependent culture procedures. Due to staffing limitations, submission of microbiological specimens after 1600 hours on weekends and holidays should be limited to critical specimens which cannot be submitted at an alternate time. Mycobacteriology, mycology, parasitology, virology and serology testing are not available on weekends and holidays. The Microbiology Section at Fort Meade, providing serology testing, is staffed Monday through Friday from 0800-1630 hours (Autovon 923-2908/4078).

c. Requisition Slips: Each request slip must contain the patient's name, Social Security Number, location or return address, physician's name (legibly written), date and time of collection, and source of specimen. Specimens arriving without this information, cannot be processed. In addition, indicate the suspected etiologic agent, and current antibiotic therapy.

d. Patient Reports:

(1) Final reports are entered into the computer on each specimen received by the Microbiology Laboratory as soon as culture methods permit.

(2) Venereal disease reports will be sent only to the authorized requesting physician, or Chief, Infectious Disease Service and his designees.

e. Telephone Reports: The Microbiology Laboratory will telephone the results of all positive blood, tissue and body fluid cultures directly to the physician. If he cannot be located, the report will be left with ward or clinic personnel having responsibility for the patient, or the head nurse of that ward. Group A beta-hemolytic streptococci isolations from throat and nasopharyngeal specimens originating from the Pediatric Clinic and the Emergency Room will be telephonically reported to the RN on duty during the normal duty hours. During weekends and holidays, the pediatric specimens will be reported to the Pediatric Resident on call and those from the Emergency Room will be reported to the RN on duty. All others will be reported to the requesting physician if a telephone number is provided.

2. OPERATION GUIDELINES

a. Close cooperation between the medical staff and the laboratory is essential if maximum cultural information is to be obtained from microbiologic specimens. Laboratory procedures and work flow are designed for numerous of specimens received by the laboratory. Special handling is available when physicians personally inform the laboratory of special needs.

b. The following recommendations are offered to avoid patient misidentification and specimen inadequacy problems.

(1) Complete and thorough labeling of the SPECIMEN. Include the patient's name, Social Security Number, location and name of physician.

(2) Microbiology request: the time and date of collection must be noted on the requisition by ward or clinic personnel. Specimens will be stamped with time and date upon processing by Microbiology personnel.

(3) Proper collection container: for safety reasons, any specimen submitted with the exterior of the specimen container contaminated must be autoclaved immediately without processing.

(4) Hazardous organisms: tularemia, brucella, plague, AFB, slow virus infections, HTLV-III, etc. This information should be communicated to the laboratory on the requisition slip (use red biohazard label). Additionally, a call should precede submission to ascertain the availability of specialized media.

(5) If routine cultures fail to provide evidence for a microbial diagnosis, consultation with the laboratory is suggested and specialized handling and procedures may be authorized. This will prevent further samples from being processed in the same manner that failed initially.

(6) If unusual or fastidious organisms are sought, the laboratory should be advised on the requisition so that special handling and appropriate media may be used (Example: nasopharyngeal culture for Neisseria meningitidis/gonorrhoeae, or Bordetella pertussis.

(7) Consultation is available through the Clinical Pathology resident on call, the Medical Director, Chief or Supervisor of Microbiology (61994), as well as the Infectious Disease Service (61740).

3. SPECIMEN REQUIREMENTS

a. Blood

(1) BACTEC vials are available on selected wards and clinics. These vials are appropriate for blood culture purposes only and are provided two (2) to a set (aerobic, anaerobic). They should not be used for other than blood culture.

(2) Blood culture vials from BACTEC will frequently grow Candida spp., however, a special biphasic medium is available and is recommended when suspicion of fungemia exists. If fungemia is suspected, contact the Microbiology Laboratory for authorization to use biphasic culture.

(3) The following STEPWISE procedures for collection of blood for culturing MUST be followed:

(a) Check expiration date on bottles.

(b) Wash hands with an iodophor solution.

(c) Prepare skin as you would for IV therapy (WRAMC Infection Control Manual).

(d) Withdraw 10 cc of blood using a 10 cc syringe.

(e) Cleanse top of each bottle separately with a Betadine sponge.

(f) Disconnect needle from the blood-drawing syringe.

(g) Connect a new sterile needle to the blood-drawing syringe for inoculation of the two BACTEC bottles.

(h) Aseptically inject 5 cc of blood in EACH bottle. It is imperative to inoculate BOTH BOTTLES. Keep bottles in upright position during the inoculation. DO NOT TILT. DO NOT touch culture solution with needle. Inoculate bottles in the following sequence: (i) Aerobic (blue label); and (ii) Anaerobic (yellow label).

(i) DO NOT INJECT AIR IN BOTTLES.

(j) If it is not possible to draw 10 cc of blood, insure that each of the bottles receives at least 3 cc blood inoculum.

(k) Needles and syringes used for injecting blood into the BACTEC bottles are disposed by ward personnel using the normal disposal methods.

(4) Handling of BACTEC Vials:

(a) Exercise extreme care in handling the glass vials. DO NOT DROP THE VIALS.

(b) If a BACTEC vial is accidentally broken, cover the involved area with paper towels. Prevent foot traffic through the spill area. Flood with Betadine disinfectant and do not disturb for 10 minutes. Notify Health Physics (576-3481 duty hours, 427-5107 non-duty hours). With disposable plastic gloves use a pad of paper towels to mop up the liquid and to pick up the pieces of glass. Place all materials in a plastic purple bag.

(c) When all the free liquid and glass fragments have been removed, use more paper towels and Betadine disinfectant to clean the affected area. Wearing rubber gloves, put contaminated materials (pieces of glass, used paper towels and gloves, etc.) into a PURPLE PLASTIC BAG. Take this bag to Nuclear Medicine for disposal.

(d) Purple plastic bags will be kept on the wards. BACTEC vials should be kept in a dry place at room temperature with the drawer labeled "Radioactive Material." These areas will be checked by Health Physics periodically.

(5) If the patient is on an antibiotic, indicate dosage on the requisition. Special antibiotic removing bottles are available upon consult with the Microbiology Section. These bottles contain resins which remove commonly administered antibiotics from samples of blood.

(6) A general guide to blood culture collection in adults is as follows:

(a) If acute sepsis is suspected and the patient is quite ill, obtain two blood cultures promptly, before initiating empiric therapy.

(b) If the etiology of fever is unknown but there is a possibility of occult abscess, obtain two blood cultures to be followed by two more in 24-36 hours if the first two remain negative.

(c) If acute bacterial endocarditis is suspected, obtain three blood cultures within the first hour of evaluation, after which empiric antibiotic therapy should be instituted.

(d) If subacute bacterial endocarditis is suspected, obtain three blood cultures during the course of the first day, to be followed by two more if the original three remain negative after 24 hours' incubation.

(7) Guidelines for collecting blood from children and infants: The volume of blood drawn from small children should be determined by the physician. In the case of infants, 1-2 ml samples of blood are usually collected. Two blood cultures usually suffice for diagnosing sepsis of the newborn. If only a small amount of blood is obtained, use only aerobic bottle.

(8) Blood culturing from areas other than peripheral veins. Cultures obtained from lines (A, CVP, etc.) and catheters are not acceptable for obtaining blood for culture.

b. Bronchospcopic Washings, Body Fluids, and CSF: Place fluid in sterile screw-capped tube. Protected bronchial brushing procedures are done upon consult with the Microbiology Section.

c. Sputum: Use sterile plastic container. Any other container such as petri dishes are unsuitable. Sputum specimens for TB should be submitted in special sterile plastic conical centrifuge tubes (blue or red caps). Specimens are examined for suitability of culturing by Bartlett's Criteria.

d. Middle Ear: Aspirate into syringe. Place syringe with needle in sterile test tube and hand carry to laboratory without delay.

e. External Ear, Eye, Throat, Wound, Urethra, and Vaginal or Cervical: "Culturette" swab.

f. Stool: Either a small stool specimen in a plastic coated cardboard container or a rectal swab via culturette. If unusual bacterial pathogens are suspected, the laboratory should be notified so that the specimen can be optimally handled for recovery of the pathogen.

g. Epidemiologic Culture: These will be accepted only following approval of the Infection Control Department, contact 61741, 61742.

h. Meningitis:

(1) A minimum of 2-ml of CSF is required for adequate bacteriological studies and more should be submitted if available. Many organisms in the CSF are fragile and prompt culturing is essential. Cooling the specimen to room temperature may inhibit the growth of N. meningitidis.

(2) It may be valuable to culture sputum or nasopharynx if N. meningitidis or H. influenzae are suspected. Throat cultures are unlikely to be of value.

(3) If cultures for tuberculosis and fungus are desired, a separate CSF sample (5 ml each) and requisition must be submitted for each specimen. A total of 12 ml of CSF is required for routine, fungal, and AFB cultures.

(4) Detection of H. influenzae type b Neisseria meningitidis Groups A, B, C, Y and 135, Streptococcus pneumoniae and Group B Streptococcus antigens in CSF and urine specimens will be done during duty hours in the routine Diagnostic Microbiology Laboratory (0600-2300).

i. Pneumonia: A single sputum specimen prior to initiation of therapy is usually adequate for culture. It is essential that sputum rather than saliva be submitted. Transtracheal, nasotracheal, or nasopharyngeal cultures may be obtained if sputum is not being produced. If bronchoscopy is carried out and washings collected for culture, the requisition should clearly indicate the source of the specimen. The copious sputum frequently produced post-bronchoscopy is an excellent culture source.

j. Lung Abscess: Obtain special anaerobic specimen containers from the laboratory.

k. Bacterial Pharyngitis: A single throat swab is adequate. If diptheria is suspected, notify the laboratory immediately so that special culture media may be obtained.

l. Bacterial Enteritis: A single stool sample or rectal swab is adequate for the diagnosis of acute Salmonella or Shigella, Yersinia, Campylobacter, Vibrio, Aeromonas, Pleisiomonas enteritis. If a Salmonella carrier state is suspected, seven stools at weekly intervals should be taken. If Staphylococcal or fungal enterocolitis or pseudomembraneous colitis is suspected, the physician should perform or request a Gram stain on a fresh specimen.

m. Peritonitis, Empyema, Pyarthrosis: Indicate the source of the material.

n. Gonorrhea: A smear for Gram stain should be made of the genital lesions or exudates. All gonorrhoeal specimens, including those from other than genital sites (blood or joint fluid), should be taken to the laboratory immediately after collection. The requisition should indicate that gonococci are suspected.

o. Urinary Tract Infections:

(1) One or two clean catch (not more than two) or one catheterized or suprapubic urine specimen should be obtained prior to initiation of therapy. If desired, a follow-up culture 48 hours after initiation of therapy (indicating antibiotic used) may be obtained. A follow-up culture one week following cessation of therapy will evaluate effectiveness of treatment. The maximum time from collection to plating should be no more than two hours.

(2) More accurate colony counts will be obtained from an early morning specimen, or at least one which has remained in the bladder three hours.

(3) Gram stains are done within two hours of collection during duty hours in the routine Diagnostic Microbiology Laboratory. Equal or greater than two bacteria per oil immersion field is considered significant. This is accomplished by viewing 20 fields and taking an average.

(4) Cultures for low colony count bacteria or for the acute urethral syndrome can be obtained upon consult from the Microbiology Laboratory.

p. Eye Cultures: In obtaining specimens for culture, material can usually be collected by retracting the lower lid and stroking the conjunctive with a sterile swab. Specimens from a corneal ulcer can be obtained by scraping the ulcer with a swab, bacteriological loop or similar sterile instrument. Smears should be delivered to Microbiology supervisory personnel as soon as possible. Giemsa stains on conjunctival scrapings will be examined for chlamydial inclusions. Drying of swabs should be avoided at all costs. If acid-fast organisms or fungi are sought, physicians should bring this to

the attention of the laboratory and submit separate request slip for the agent suspected.

q. Chanchroid: Cultures for H. ducreyi may be coordinated through the Microbiology Section. Prior consultation is required to ensure availability of selective media and prompt handling of specimens.

r. Legionnaires Disease: Cultures and direct F.A. for Legionella spp. may be coordinated through the Microbiology Section. Prior consultation is required to ensure availability of selective media and prompt handling of specimens.

s. Skin: Quantitation bacterial counts. Done on consult with Microbiology Section.

t. Gastrointestinal Tract: Quantitative bacterial count will be done upon consult from Infectious Disease and Gastroenterology Services.

u. Spirochetes: Dark-field microscopy is available for examination of appropriate specimens. Prior consultation with the Microbiology Section is required.

v. Leptospirosis: Cultured upon request through the Microbiology Section.

4. UNUSUAL AGENTS

a. If the following agents are suspected, consult the Microbiology Laboratory:

(1) Brucella species
(2) Francisella tularensis
(3) Yersinia pestis
(4) Listeria monocytogenes
(5) Spirillum minus
(6) Streptobacillus moniliformis
(7) Vibro species
(8) Campylobacter species
(9) Legionella spp
(10) Haemophilus ducreyi
(11) Bordetella pertussis
(12) C. diphtheria
(13) Leptospira interrogans

Some of the above agents will not grow on routine media; others require special handling either because of fastidiousness of growth requirements or because biohazard precautions are necessary.

5. ANAEROBIC CULTURES

a. Containers for the transport of specimens for anaerobic cultures are made available to the wards and clinics thru Material Disbursing Branch (MDB). B-D vacutainers which include a sterile swab can also be used for fluids. A stoppered syringe is also an acceptable method of transport. Culturette swabs are NOT acceptable for anaerobic cultures and will be rejected. The following specimens are acceptable for anaerobic cultures.

(1) Normally sterile body fluids (CSF, pleural, peritoneal, amniotic, synovial, culdocentesis); body and bone marrow specimens.

(2) Tissue samples or other specimens obtained surgically.

(3) Aspirations of pus or swabs taken from deep wounds where care has been taken to avoid surface contaminants.

(4) Transtracheal aspirates.

(5) Endometrial cultures where care has been taken to avoid the normal flora of the cervix.

(6) The following specimens are NOT acceptable for anaerobic culture because large numbers of anaerobic bacteria are present as normal flora:

(a) Throat, nose or oral swabs.

(b) Expectorated sputum, broncoscopy exudates.

(c) Vaginal, cervical swabs.

(d) Urine, voided or catheterized (suprapubic taps yield anaerobes very infrequently but may be processed following consultation with the Medical Director).

(e) Feces, colostomy, or iliostomy effluent.

(f) Skin, external ear, or superficial wounds.

(g) Appendiceles.

6. GUIDELINES FOR EVALUATING MICROBIOLOGICAL CULTURE RESULTS (See Table I)

7. ANTIBIOTIC SUSCEPTIBILITY TESTING

a. The Microbiology Section performs the agar dilution method for routine antibiotic susceptibility testing of bacterial isolates obtained from clinical material.

b. The agar dilution test is performed on antibiotic containing agar

plates. A separate plate is employed for each dilution of antibiotic tested. The concentrations of antibiotics tested have been based upon blood levels usually achievable by standard doses of antibiotics in common use. Table II summarizes the expected blood levels after antibiotic administration, compared to broth and agar dilution levels of the antibiotics commonly tested.

c. Colonies of each bacterial isolate tested are suspended in both and incubated to a desired turbidity. A standard inoculum of bacteria is applied to the surface of antibiotic-containing agar plates. The plates are then incubated overnight. The lowest concentration of antibiotic which inhibits growth of the organism (the minimal inhibitory concentration or MIC) is the result reported on the computer printout.

d. The results of agar dilution susceptibility testing should be interpreted according to the same principles of any antibiotic test. The interplay of three factors must be considered: 1) the concentration of antibiotic employed; 2) the bacterial isolate, and 3) the environment in which the interaction of antibiotic and bacterium occurs. It is not possible to construct an in vitro test to precisely mimic the clinical situation. Susceptibility tests measure only relative antimicrobial activity under standardized in vitro conditions. If an organism is resistant to a high concentration of antibiotic in the test, that antibiotic is unlikely to be clinically useful. Even though an organism may be susceptible to a given antibiotic in vitro, it may or may not be effective in vivo. Multiple variables including specific drug activity, site of pathology, pH, ionic strength, route of administration, and other individual clinical factors may influence the clinical response.

e. The WHO Committee for Antimicrobial Testing, among others, advise that susceptibility tests be standardized such that "susceptibility" is defined as one-fourth to one-half the average peak blood level. This procedure was followed in obtaining the concentrations for testing used at WRAMC.

f. Staphylococci which are not susceptible to Ø.1 mcg/ml of penicillin are regarded as penicillinase producers and hence resistant to all the nonstaphylococcal penicillins, including ampicillin. Serious infections, even those susceptible to Ø.1 mcg/ml, should be tested for penicillinase (beta lactamase).

g. Orgamisms isolated from urine will also be tested with gantrisin, septra, and nitrofurantoin.

h. Routine susceptibility for Gram positive bacteria will be limited to Staphylococcus aureus, Staphylococcus epidermidis and Enterococcal streptococcus. Some organisms grow poorly on the test medium used for agar dilution. For the occasional patient with septicemia or other infection caused by alpha hemolytic streptococci or diphtheroids, it is necessary to perform susceptibility testing as a special procedure. Blood and body fluid antibiotic levels higher than those tested can be obtained with some antibiotics under special circumstances. Special dilution procedures may be

required to assess such situations. Advice may be obtained from the Microbiology Section.

i. Serum Cidal Levels (Schlichter Assay). Submit blood specimens in sterile yellow topped tubes. Assays will be done upon consult from the Pediatric and adult Infectious Disease Services. Submit peak levels (1/2 - 1 hour) after last dose and through level collected right before next dose.

j. Therapeutic Drug Monitoring. Submit blood specimens in sterile yellow topped tubes. Assays will be done upon consult from the Microbiology Section.

k. Biphasic Blood Culture. Bottles are stored in the Hematology-Oncology Clinic and the Microbiology Section. Consult the Microbiology Section for proper use of these bottles.

8. MYCOBACTERIOLOGY (TB)

a. Acid-Fast (TB) Laboratory: The Mycobacteriology Laboratory is staffed 0745-1600 hours Monday through Friday. Specimens should be collected to arrive no later than 0830 to insure same day processing. Specimens must be collected in clean, sterile containers, preferably the double-walled plastic containers, #6530-837-7472. The specimen container must bear the patient's name, SSN, location and doctor. Mycobacteriology (TB) culture procedures require lengthy incubation. Negative culture results will not be available for 8 weeks (Ext. 61998).

b. Sputum: These specimens should be a series of three single, early morning samples. A volume of 5-10 ml is appropriate. Nebulized sputa should be labeled as such so that these are not misinterpreted as saliva and consequently discarded.

c. CSF: A minimum of 5 ml of CSF is required for AFB smear and culture. A total of 12 ml are required for routine culture, AFB, and fungus. Clearly label specimens sent for CSF culture for tuberculosis. For overall microbiological culture (bacteriological, fungal, AFB), 12 ml of CSF is required along with six separate lab slips (3 for cultures; 3 for smears).

d. Urine: Urine for acid-fast bacilli culturing will only be done on Infectious Disease consult. A series of daily, single, mid-stream urines, voided early in the morning, should be submitted. Twenty-four hour collections will not be accepted.

e. Tissue: Tissue to be processed for AFB should be collected aseptically and kept moist with sterile, non-bacteriostatic physiologic saline, and transported to the laboratory as soon as possible.

f. Other Specimens: These may include any aseptically collected specimens. Body fluids should be kept from clotting with a small amount of heparin. Swabs may be acceptable where a more voluminous specimen cannot be obtained. Blood and stool specimens will not be processed for AFB.

g. Actinomycotic Infections:

(1) Actinomycosis: Specimens (pus from draining sinuses, aspirated fluid from subcutaneous lesions, IUDs) should be collected and transported anaerobically to the laboratory.

(2) Nocardiosis: These specimens may include sputa, CSF, pus from abscesses, and bronchial washings.

9. MYCOLOGY (FUNGI)

a. Hours and Staffing: The mycology laboratory is staffed from 0745-1600 hours Monday through Friday. Specimens should be scheduled to arrive as early in the morning as possible for processing on the same day.

b. A separate requisition slip for each procedure requested is required. Smears and cultures are separate procedures. Fungal procedures require lengthy incubations (negative results may not be available for six weeks - telephone 576-1998 for results). It is extremely important to tell the laboratory what mycotic agents are most likely from a clinical viewpoint. This information is an invaluable guide to the laboratory examination of a specimen.

c. Superficial and Cutaneous Mycoses: In lesions involving the skin and hair, scrapings should be obtained with a scapel after carefully washing the site with 70% alcohol. In ringworm of the glabrous areas, the specimen should be collected from the active border of the lesion. Hair should be plucked with tweezers from the edges of the infection. These specimens may be sent to the laboratory in sterile petri dishes, or between flamed slides, sealed with tape.

d. Subcutaneous Mycoses:

	Agent	Specimen
(1)	Chromoblastomycosis	Crust and scraping from warty areas
(2)	Mycetoma	Pus from draining sinuses Aspirated fluids from unopened sinuses Biopsy specimens
(3)	Sporotrichosis	Pus from ulcers Aspirated fluid from subcutaneous abscesses

These materials should be put in sterile containers and submitted to the lab. Scrapings and biopsy specimens for rhinosporidosis should be submitted to Anatomic Pathology for histological examination.

e. Systemic Mycoses:

Agent	Specimen
(1) North American Blastomycosis	Scrapings from edge of lesion Pus from open abscesses Pus from a sinus tract Urine Sputa Bronchial washings
(2) South American Blastomycosis	Scrapings from edge of lesions Scrapings from mucous membranes Biopsies, lymph nodes Sputa Bronchial washings
(3) Candidiasis	Sputa Bronchial washings CSF Urine Stools
(4) Coccidioidomycosis	Sputa Bronchial washings CSF Urine Scrapings from skin lesions Pus from draining sinuses
(5) Cryptococcosis	CSF Sputa Pus from abscesses Pus from sinus tracts Scrapings from skin lesions Urine
(6) Geotrichosis	Sputa Bronchial washings Stool
(7) Histoplasmosis	Blood Sternal marrow Sputa Bronchial washings CSF Pus from sinus tracts Exudate from ulcers Scrapings from skin lesions

(8)	Aspergillosis	Sputa Bronchial washings
(9)	Mucormycosis	Sputa Bronchial washings Biopsy material

These materials should be put into sterile containers and delivered to the laboratory as soon as possible to prevent bacterial overgrowth or fungal contamination. Isolation of fungi from blood specimens preferably should be attempted by inoculation of biphasic medium available in Microbiology or through consultation from the Infectious Disease Service.

10. PARASITOLOGY

a. Hours and Staffing: The Parasitology Laboratory is open from 0745-1600 hours Monday through Friday. Specimens must be accompanied by a parasitology requisition (SF-552). All requested clinical information must be provided. Appropriate information will allow the staff to select tests most appropriate for a particular specimen. Specimens which have been frozen or dried (except scotch-taped preparations for pinworms) are not acceptable.

b. Specimen Collection:

(1) Fecal Specimens:

(a) For most intestinal parasites (helminth ova, protozoan cysts and trophozoites), at least 5 grams (golf-ball size), freshly passed feces should be collected in a clean, waxed cardboard container. Specimens should not be collected from toilet bowl and mixture with urine is to be avoided.

(b) Fecal specimens are not suitable for parasitology for at least a week following administration of barium sulfate, cholecystographic medium, antidiarrheal compounds or antacids containing particulate matter, bismuth, magnesia, or mineral oil.

(c) If liquid stool specimens cannot be submitted to the laboratory within one hour, they should be preserved with three parts of PVA (polyvinyl alcohol) to one part of stool. PVA is available in the Parasitology Laboratory. Formed stools may be submitted up to 24 hours old providing they have been refrigerated.

(d) Since many parasitic species shed their eggs sporadically, collections of specimens at 2-3 day intervals is more productive than daily specimens.

(2) Anal Swabs and Tapes: Specimens for demonstration of Enterobius vermicularis (pinworms) may be collected on scotch-tape or with a vaseline paraffin swab. Three daily specimens should be collected, either between 2100 hours and midnight or early in the morning. Scotch tape should be transparent

and applied to the slide without air bubbles. Questions regarding submission of specimens should be directed to Microbiology Laboratory, Ext. 61994.

(3) Sigmoidoscopic Specimens: Sigmoidoscopic specimens for amoebae should be collected with a flat wooden spatula. Drying of specimen is to be avoided. The end of the spatula should be broken off and placed in 1 ml PVA (available from Parasitology Laboratory).

(4) Duodenal Aspiration: Aspiration for Giardia lamblia and Strongyloides stercoralis should be handled in the same manner as stool. Gelatin string tests must be coordinated through the Microbiology Section.

(5) Rectal and Bladder Biopsy: Biopsies for Shistosoma ova should be placed unfixed in a petri dish and kept moist with a piece of gauze or filter paper. Duplicate specimens should be sent to Surgical Pathology.

(6) Urine: Shistosoma ova generally appear in the last portion of the urine voided. Examination for Trichomonas vaginalis should be done on the first part of the voided specimen. Fresh specimens are essential.

(7) Sputum: Sputum should be collected in the same manner as for bacteriologic culture. It may be examined for nematodes, amoebae, Echinococcus, or flukes.

(8) Miscellaneous: Material such as aspirate from hepatic abscess should be submitted in a screw-top vial for examination for amoebae or other parasites.

(9) Animal Sources: Specimens from animal sources will be accepted only in circumstances of suspected association with human infection (e.g., visceral larva migrans and echinococcosis).

(10) Stool for Occult Blood: Use the parasitology requisition and send a small sample of feces in the same manner as for examination of parasites. The laboratory uses the Guiac test.

(11) CSF: Suspected parasitological infections should be coordinated with the Microbiology Section.

(12) Blood: Specimens for detection of malaria and other blood parasites should be collected in purple topped tubes and submitted for examination.

(13) Analysis of stool specimen for Cryptosporidiosis is done on consult from Infectious Disease Service only.

(14) Consultation: Any question regarding specimen collection or interpretation of results may be addressed with Parasitology Unit, 576-1994/1995.

11. VIROLOGY

a. Viral isolation and serological procedures are available at the Microbiology Section, Department of Pathology and Area Laboratory Services.

b. Guide to WRAMC Virology Services:

(1) The Microbiology Laboratory will be the point of contact for virology services to all elements of the hospital. The Microbiology Laboratory will supply each user section (ward, clinic, etc.) with viral transport medium and all required patient data forms. The viral transport medium supplied will be tryptose phosphate broth with 0.5% gelatin added. This medium should be stored at normal refrigerator temperatures prior to use. All specimens should be taken directly to the Mirobiology Laboratory as soon after collection as possible.

(2) Specimen Submission: The types of specimens submitted for virus isolation will depend somewhat on the clinical manifestations of the illness, but because a wide range or viruses may cause very similar syndromes (refer to Table V), it is common practice to submit, as a minimum, the specimens listed by broad disease categories below.

Clinical Specimens for Virus Isolation

Respiratory Diseases	- Throat swab or throat washings - Acute and convalescent sera - Post mortem lung
Central Nervous System Diseases	- Throat swab or throat washings - Stool specimen - Cerebrospinal fluid - Acute and convalescent sera - Post mortem brain and cord
Viral Exanthems	- Throat swab or throat washings - Vesicle fluid - Stool specimen - Acute and convalescent sera
Gastrointestinal Diseases	- Throat swab or throat washings - Stool specimen - Acute and convalescent sera
Rotovirus Analyses	- Call Microbiology Laboratory for special instructions

Specimens submitted for virus isolation should be collected during the phase of illness when they are most likely to contain the virus in high titer. For example, throat swabs for the isolation of respiratory viruses should be collected within 48-72 hours after onset of symptoms, whereas polio and other

enteroviruses may be isolated frequently from stool specimens collected as much as 10 days after onset of meningeal symptoms.

It is mandatory in the submission of body fluids (urine, saliva, buffy coat) for the isolation of such viruses as Cytomegalovirus (CMV) and Rubella virus that they be prominently labeled and shipped on wet ice. It should also be mentioned that even under ideal conditions, the isolation rate for CMV and Rubella virus from urine is extremely low due to their extreme lability. Respiratory Syncytial Virus and Rhinoviruses are likewise difficult to isolate in the laboratory. In three of these cases serologic analysis is extremely important in determining patient management. Rhinovirus serologies are not routine done.

All virology specimens and their accompanying patient data forms are to be taken directly to the Microbiology Laboratory as soon as possible; the longer a specimen stays on the ward the lower the probability of isolating a virus becomes.

For additional transport medium and/or assistance in collecting specimens for virus isolation, please call 61289/61994/61995.

(3) Specimen Collection

Throat Swab: Use a dry cotton tip applicator to vigorously swab the tonsilar pillars and behind the uvula. Break off in a tube of Viral Transport Medium, cap tightly, label and transport to the Microbiology Lab without delay.

Throat Wash: Have patient gargle with Viral Transport Medium and expectorate into a labeled sterile specimen cup and trans port directly to Microbiology Lab.

Stool Specimen: Patient should defecate into a clean cardboard carton. Seal the carton, label and deliver to Microbiology Lab.

Rectal Swab: Second choice when stool is unavailable. Moisten cotton tip swab with Viral Transport Medium and insert in anus until cotton tip is no longer visible. Break off applicator in Viral Transport Medium tube, cap tightly, label and deliver directly to Microbiology Lab.

Cerebrospinal Fluid: Collect 3-5 ml in a sterile screw cap tube, label, and deliver to Microbiology Lab. Do not dilute with viral transport media.

Urine: Collect 20 to 30 ml of a randomly voided specimen in a sterile screw top urine cup. If CMV is

suspected, write "CMV" on outer label with a felt tip pen. Deliver to Microbiology Lab. Three separate urine specimens collected on consecutive or alternate days is recommended for optimal recovery of CMV. Delivery to lab should also be immediate to increase recovery rates for CMV.

Body Fluids (Exudate, Vesicular Fluids): Aspirated fluids should be mixed with Viral Transport Medium and carried to Microbiology Lab. (A swab of the freshly exposed surface of the lesion aspirated is also indicated.) Suspected Varicella requires consultation with Microbiology Section (61994/61289).

Tissue Scrapings: Tissue scrapings should be placed directly into labeled Viral Transport Medium, capped and carried to Microbiology Lab.

Biopsy/Autopsy Material: Tissue specimens should be 5-10 grams. They must be collected in sterile screw cap containers and moistened with saline. No specimen should be treated with formalin or any other fixative/preservative. Transport specimens direct to Microbiology Lab.

Serum Specimens: A four-fold rise in titer is diagnostic for viral infections. Whole blood is collected in 7 ml red top vacutainers and allowed to clot. The clot is removed and the serum is sent to the laboratory for testing.

(a) Acute Sera: Collected 24 to 48 hours after onset of symptoms and submitted concurrently with specimen for virus isolation.

(b) Convalescent Sera: Collected 14 to 21 days after acute specimen and submitted through Microbiology Lab.

(c) Exceptions: Convalescent sera are not required for Rubella in pregnancy or congenital viral diseases of the newborn.

(4) WRAMC Locations Where Viral Transport Media are Stored (refrigerated)

(a) Ob-Gyn - Room 1M46
(b) Pediatric Clinic - 1K09

(c) Dermatology - 1J49
(d) Infectious Disease Clinic - 7C
(e) Pediatric Ward 51 - 5153
(f) Nursery Ward 42 - 4307
(g) Eye Clinic
(h) Dental Clinic - 1D56

c. Submission of Specimens for isolation of Chlamydia. Specimens for diagnosis of chlamydial infections should be chosen from the list below to improve the probability of obtaining a laboratory diagnosis.

(1) Clinical Specimens for Chlamydia Isolation:

(a) Ocular Infection: Conjunctival swab.

(b) Genital Infections:

Male: Urethra: Endourethral swab.
Epididymis: Aspirate.

Female: Cervix: Endocervical Swab
Urethra: Swab
Fallopian Tubes: Lumen Swab and/or tissue biopsy.

(c) LGV: Pus and aspirates.

(d) Infant Respiratory Infections: Nasopharyngeal swab.
Tracheobronchial aspirate.
Lung biopsy.

(e) Otitis Media: Aspirate

(2) Specimens submitted for isolation of Chlamydia must, when possible, be collected prior to antibiotic therapy. Specimens obtained after initiation of antibiotic therapy may result in the formation of atypical inclusions thus initiation of such therapy must be noted on history form.

(3) Relapse and/or reinfection is not uncommon in Chlamydial infections. Cultures to check efficacy of treatment should be obtained one to three weeks after cessation of therapy. The patient should be counseled to refrain from sexual activity during this follow-up period.

d. Specimen Collection Consideration:

(1) Chlamydia are extremely labile outside the host environment. Proper handling of specimens cannot be overstressed in attempts to establish a diagnosis by isolation of the agent in the laboratory. Specimens must not be collected on dacron swabs or wood-shafted swabs.

(2) A highly protective transport medium specifically designed for Chlamydia (2SP) is available through the Microbiology Section.

(3) Specimens should be placed directly into cold (4°C) transport medium and expeditiously delivered to the laboratory. If a delay between time of collection and time of delivery to lab of more than 24 hours occurs, specimen must be frozen at -70°C or lower, otherwise specimen should be kept until delivery at 4°C.

(4) Requests for transport medium may be made by calling the Microbiology Lab at 61289/61994/61995.

e. Specific Specimens to Collect:

(1) Conjunctival Swabs: Use a sterile swab to cover as much of the membrane as possible without touching the skin, eyelids, or eyelashes. The swab should then be placed in transport medium, sealed, labeled and frozen.

(2) Endourethral Swabs: Insert a swab 4-6 cm past the meatus, handle as in 1, above. Meatus swabs, discharges, urines, and urine sediments are unsatisfactory specimens and will be not be cultured.

(3) Epididymal Aspirates: Take aspirates under local anesthetic by injecting sterile physiological saline. Add aspirate to transport medium and freeze.

(4) Endocervical Swab: Rotate swab in the TRANSITIONAL ZONE of the endocervix and freeze in transport medium.

(5) Urethra (Female): Swab as above. NOTE: This is an important site in the recovery of Chlamydia from contacts of males with NGU.

(6) Fallopian Tubes: Take specimens during laparoscopy. Swab the lumen from the abdominal opening. Take minute biopsy from the fimbrae. Ship frozen in transport medium. NOTE: Fluids from the pouch of Douglas are unsatisfactory!

(7) Pus or Aspirate of Lymph Node (LGV): If fluctant, aspirate pus. If the bubo is not fluctant, inject sterile saline and aspirate. Ship frozen in transport medium.

(8) Nasopharyngeal Swab: Must be from posterior of nasopharynx. Wire-handled Calgi-swabs may be used. Swabs of the throat and oropharynx are not satisfactory. Ship frozen in transport medium.

(9) Tracheobronchial Aspirate: Feed bronchial suction tube down to level sufficient to obtain a bronchial aspirate. Cut tube off into Chlamydia Transport Medium and SHAKE to mix aspirate with transport medium.

(10) Middle Ear Aspirate: Obtain aspirate by myringotomy, combine

with transport medium, freeze.

(11) Serum Specimens: Current serological techniques allow meaningful results only in cases of psittacosis and LGV. These specimens should be submitted to the Viral Serology Lab as in the past.

All specimens for Chlamydia isolation should be delivered to the Microbiology Laboratory, WRAMC, for processing.

A completed laboratory request slip AND history form must accompany all specimens for Virus or Chlamydia isolations.

Transport media for Virus and Chlamydia isolations are not interchangeable.

Call the Microbiology Laboratory (61289/61994/1995) for specific information concerning specimen requirements and collection of specimens.

f. Herpes Reports: Obstetrics

(1) During normal duty hours, a current status report on a pre-delivery Herpes simplex culture may be obtained by calling the Virology Laboratory (61289).

(2) For current status reports required outside normal duty hours, the attending physician should call the Pathology resident on call. The following information is required:

(a) State that a Herpes Delivery Report is required.
(b) Physician's name.
(c) Physician's telephone number.
(d) Patient's name.
(e) Patient's SSN.
(f) Date of latest specimen.

12. STERILIZATION/AUTOCLAVE: QUALITY CONTROL STRIPS

a. Spordex: Requestors should submit spore strips in manufacturer's envelope pack, or preferably AMSCO, Proof ™ biological/chemical indicator ampules. Both the envelope and a lap slip (SF-557) should be completed. Telephone numbers should be included in the event that positive cultures are found. The laboratory will notify the submitter immediately upon finding a positive result.

13. SEROLOGY

a. General Information:

(1) Serology tests are performed by the Serology Unit, Microbiology Section, Department of Pathology and Area Laboratory Services, Fort Meade, Maryland 20755. The telephone number is Autovon 923-4078/2908 or Commercial (301) 677-4078/2908.

(2) Specimens should be submitted to WRAMC Laboratory Receiving Desk. Twice daily courier service between the laboratory at Fort Meade and WRAMC will allow specimens and test reports to reach the appropriate lab sites without delay.

(3) The serology laboratory is staffed Monday through Friday from 0730 to 1600 hours. Test results on specimens received by 1000 hours are generally available within 24-48 hours.

(4) Viral serology tests are performed at least once weekly, and more frequently if staffing permits. Acute and convalescent sera are generally required for most viral serology, and are processed as pairs. Acute serum should be drawn as soon after onset as possible and the convalescent serum 21 to 28 days later. Single serum specimens may be submitted for rubella, rubeola and mumps tests to determine immune status.

(5) Separate request slips (SF-557) are required for each test desired. Each request slip must contain patient's name, SSN, ward, WRAMC, date of collection and requesting physician.

(6) The serologic tests currently available, as well as special instructions and normal values, are listed in Table III.

b. Special Serology Requests are submitted to the Microbiology Section in the hospital lab, Room 2B59, in red topped vacutainer tubes. These specimens are then dispatched to the particular lab performing the test.

(1) Tests performed by Infectious Disease Lab, Room 2B26, WRAMC

CIE for Streptococcus pneumoniae, N. meningitidis, H. influenzae, Techoic Acid Antibody

(2) Tests performed by Center for Disease Control, Atlanta, Georgia.

Meliodosis (Pseudomonas pseudomallei)
Visceral Larva Migrans (Toxocara)

(3) Test performed at Forest Glen Hazard Lab (427-5110)

Plague (Yersinia pestis)

(4) Test performed at Fitzsimons Army Medical Center, ATTN: Ms. Rothlanf (Autovon 943-3043) Clinical Investigation Service.

Isoniazid (INH) Levels

c. Phenylketonuria (PKU) requests are collected from heel sticks on infants on the PKU Test Specimen Cards (BBL 31111) and submitted to the Microbiology Section for processing.

TABLE I

GUIDELINES FOR EVALUATING MICROBIOLOGY CULTURE RESULTS

SPECIMEN SOURCE	NORMAL FLORA Not to be Reported	POTENTIAL PATHOGENS (Specific Pathogens will be reported)	SUSCEPTIBILITY TESTING DONE?	REMARKS
Sputum	Neisseria sp. other	Beta streptococci	No	Identification of Group A Beta streptococci based on sensitivity to Bactracin/SXT. Anaerobic culturing is usually not done from these sites. Organisms of normal respiratory flora will be listed on sinus cultures.
Bronchial washings	than meningititis	Str. pneumoniae	No	
Trachael aspiration	and gonorrhoeae	N. meningitidis	No	
	Micrococcus sp.	Gram negative rods	Yes	
Sinuses	S. eipdermidis	Hemophilus spp.	Yes	
Nasopharnyx	Diphtheroids	Yeast and S. aureus in 3+, 4+ amounts		
	Alpha and Gamma streptococci			
	Coliforms - yeast, Hemophilus spp.			
	Light growth of S. aureus and enterococcus			
Throat		Beta streptococci	No	Throat cultures are screened for Beta hemolytic strep. Heavy growth of other pathogens will be indicated.
		Heavy growth S. aureus,	No	
		Gram negative rods, Str. pneumo, yeast	No	
Urine, clean catch	Normal skin flora, e.g., S. epidermidis, diphtheroids, Micrococcus sp., Alpha streptococci	All organisms over 10,000/ml in quantity	Yes	
Catheter, Supra-pubic		All organisms grown within 48 hours	Yes	Exception: Mixed skin flora

TABLE I

SPECIMEN SOURCE	NORMAL FLORA (Not to be Reported)	POTENTIAL PATHOGENS (Specific Pathogens will be reported)	SUSCEPTIBILITY TESTING DONE?	REMARKS
Stool	All Gram negative bacilli other than Salmonella, Shigella, Arizona spp. Nonfermentative bacilli Staphylococcus spp. (light) Enterococcus All anaerobes	Salmonella sp. Shigella sp. Arizona sp. Vibrio spp. S.aureus in 3+, 4+ amounts Yeast in 3+, 4+ amounts Campylobacter sp. Yersinia sp. Aeromonas Pleisiomonas	Yes Yes Yes Yes Yes	Vibrios are cultured by consult only Campylobacter sp. require a special request Pure or heavy growth of Pseudomonas aeruginosa in the absence of normal fecal flora will be indicated (immunosuppressed patients)
Vagina, cervix	All and Gamma streptococci S. epidermidis Diphtheroids Micrococcus sp. Lactobacilli Bacillus sp. Light growth (1-2+) of coliforms, yeast, Bacteroides, Clostridium Anaerobic cocci Other anaerobic bacilli	N. gonorrhoeae Beta strep in 3-4+ amounts Coliforms in pure growth, yeast in heavy (3-4+) growth Gardnerella vaginalis in 3-4+ amounts	Beta lactamase production No when applicable	Beta streptococci reported as: 1. Group A 2. Group B 3. Group D 4. Not Group A, B, D
Uterus: Endometrium Placenta		All organisms	when applicable	

TABLE I

SPECIMEN SOURCE	NORMAL FLORA (Not to be Reported)	POTENTIAL PATHOGENS (Specific Pathogens will be reported)	SUSCEPTIBILITY TESTING DONE?	REMARKS
Other Urogenital: Prostate Bartholin Urethra	Alpha and Gamma strep S. epidermidis Diphtheroids Micrococcus sp. Lactobacilli Bacillus sp. Coliforms and yeast Anaerobic cocci	N. gonorrhoeae Coliforms and all other bacteria, yeast in moderate or heavy (3-4+) growth to include S. Aureus Streptococcus, Group A,B Streptococcus, Group D	Beta lactamase Yes No Yes	
Skin, decubitus, furuncles	Diphtheroids Micrococcus sp. Alpha and Gamma strep Neisseria sp. other than meningiditis S. eipdermidis Coliforms 1-2+	All organisms not considered "normal skin flora"	When applicable	

TABLE II

ANTIBIOTIC SUSCEPTIBILITY TESTING*

ANTIBIOTIC	ANTIBIOTIC RANGE USUALLY TESTED Agar Dilution (mcg/ml)	Broth Dilution (mcg/ml)	APPROX. MIC FOR SUSCEPTIBLE MCG/ML	DOSE AND ROUTE	BLOOD LEVEL mcg/ml (time after dose - hrs)
Amikacin	2, 4, 8, 16, 32	.04-25	<16	7.5 mg/kg IM	26 (1-2)
Amoxicillin			≤ 8	0.25 g PO	5.1 (2)
				0.5 g PO	10.8 (2)
				1.0 g PO	20.6 (2)
Ampicillin	1, 2, 4, 16	.08-50	≤0.2 (Staph)	0.5 gm PO	3.8(2)
			≤8.0 (Others)	0.5 gm IM	3.9(1)
				1 gm IM	10.1(1)
				0.5 gm IV (bolus)	17(0.25)
				0.5 g IV/hr (continuous)	29.3(at equilibrium)
Bacampicillin			≤	0.4 g PO	6.1-7.7(1)
				0.8 g PO	11.09-12.72(1)
Carbenicillin	16, 32, 64, 125	1.8-1000	<16 (for Proteus sp., E. coli, Enterobacter)	0.5 gm IM	9(1)
				1 g IV/hr (continuous)	160 (at equilibrium)
			≤ 128 (for Pseudomonas aeruginosa	5 gm IV in 2 hr (with probenecid)	200(1)
Cefoperazone			≤ 8	0.25 g IM	21.8(1)
				0.5 g IM	33.4(1)
				1.0 g IM	73.9(1)
				0.5 g IV (bolus)	75.8(0.25)
				1.0 g IV (in 2 hr)	90.1 (0)
				1.0 g IV (in 1 hr)	125(0)
				1.0 g IV (bolus)	152.4(0.25)
				2.0 g IV (in 2 hr)	223.4(0)
				2.0 g IV (in 1 hr)	232(0)
				2.0 g IV (bolus)	243.7(0.25)
				3.0 g IV (in 2 hr)	347.5(0)

* The Medical Clinics of N. America, McHenry and Lorner, 1978, W. B. Saunders

TABLE II

ANTIBIOTIC	ANTIBIOTIC RANGE USUALLY TESTED Agar Dilution (mcg/ml)	Broth Dilution (mcg/ml)	APPROX. MIX FOR SUSCEPTIBLE MCG/ML	DOSE AND ROUTE	BLOOD LEVEL mcg/ml (time after dose - hrs)
Cefotaxime			≤ 8	0.5 g IM	10.2-11.9 (0.37-0.5)
				1.0 g IM	20.5±1.9(0.5)
				0.5 g IV (in 5 min)	37.1-41.0(0-0.33)
				1.0 g IV (in 30 min)	41.1±11.6(0)
				1.0 g IV (in 5 min)	93-102.4(0-0.33)
				2.0 g IV (in 30 min)	132±11.3 (0)
				2.0 g IV (in 5 min)	160-214.1(0-0.33)
Cefoxitin			± 16	0.5 g IM	10.9 (0.33)
				1.0 g IM	22.5 (0.33)
				1.0 g IV (in 2 hr)	27(0.5-1.0)
				1.0 g IV (in 0.5 hr)	74(0.5-0.75)
				1.0 g IV (in 3 min)	124.7 (0.08)
Cefsulodin			≤ 16	0.25 g IM	9-13.8(0.5-1.0)
				0.5 g IM	17-21(0.5-1.0)
				0.5 g IV (in 1 hr)	35(0)
				1.0 g IV (in 1 hr)	60(0)
				2.0 g IV (in 1 hr)	120(0)
				1.0 g IV (bolus)	94(0.17)
				2.0 g IV (bolus)	82.6(0.5-1.0)
Cephalothin	0.5, 4, 8, 16	.16-100	≤12.5	0.5 gm IM	10.1(0.5)
				1 gm IM	21.8(0.5)
				0.5 gm IV/hr (continuous)	17.8(at equilibrium)
Clindamycin	0.5, 1, 2, 8	.08-50	0.1-3.1	0.25 gm PO	2.4-3.1(0.75-3)
				0.3 gm IM	5.3(2)
				0.6 gm IM	5.2(2)
				0.3 gm IV in 10 min	5.4(0.17)
				0.6 gm IV in 20 min	8.4(0.33)
				0.9 gm IV in 30 min	10.4(0.5)
				1.2 gm IV in 45 min	15.9(0.75)

TABLE II

ANTIBIOTIC	ANTIBIOTIC RANGE USUALLY TESTED Agar Dilution (mcg/ml)	Broth Dilution (mcg/ml)	APPROX. MIC FOR SUSCEPTIBLE MCG/ML	DOSE AND ROUTE	BLOOD LEVEL mcg/ml (time after dose - hrs)
Cotrimoxazole (Trimethroprim, Sulfamethoxazole)	23.75 (SMZ) 1.25 (TMP)		≤ 2 TMP ≤38 SMZ	Ø.16 gm TMP and Ø.8 gm SMZ PO	1-2 TMP and 4Ø-6Ø SMZ (2-4)
Cyclacillin			≤8	Ø.25 g PO	5-5.89(Ø.5)
				Ø.5 g PO	14.5+2.12(Ø.5)
				1.Ø g PO	32+5(Ø.5)
Dicloxicillin	Tested as Methicillin	Tested as Methicillin			
Doxycycline	Tested as Tetracycline	Tested as Tetracycline			
Erythromycin	Ø.5, 1, 2, 4	.Ø4-25	Ø.1-1	Ø.25 gm PO (stearate)	Ø.13-Ø.4(2-4)
				Ø.5 gm PO (stearate)	Ø.87(4)
				Ø.25 gm PO (estolate)	1.39-1.84(2-4)
				Ø.25 gm PO q6H (stearate)	1.19(2) and Ø.33(6) after 5th dose
				Ø.25 gm PO q6H (estolate)	4.47(1) and, 2.4(6) after 5th dose
Gentamicin	1, 2, 4, 8	.Ø4-25	Ø.1-3	≤1.3 mg/kg IM or IV	3.7(Ø.5-Ø.75)
				1.5 mg/kg IM or IV	4.7(Ø.5-Ø.75)
				2.Ø mg/kg IM or IV	5.2(Ø.5-Ø.75)
Methicillin	2, 4, 8, 16	.Ø4-25	Ø.8-6.3	1 g IM	16(Ø.5)
				1 g IV	32.5(Ø.25)

TABLE II

ANTIBIOTIC	ANTIBIOTIC RANGE USUALLY TESTED Agar Dilution (mcg/ml)	Broth Dilution (mcg/ml)	APPROX. MIC FOR SUSCEPTIBLE MCG/ML	DOSE AND ROUTE	BLOOD LEVEL mcg/ml (time after dose - hrs)
Mezlocillin			≤ 25	1 g IM	15.6±0.7(0.75)
				1 g IV (bolus)	101±11.3(0.25)
				3 g IV (in 15 min)	269 (0.25)
				4 g IV (in 5 min)	294 (0.08-0.25)
				5 g IV (bolus)	424 ± 91(0.08)
				5 g IV (in 30 min)	403 ± 81 (0.08)
Netilmicin			≤ 8	1 mg/kg IM every 12 hr	
				day 1	4.2(1)
				day 3 to 7	3.4-4.7(1)
				2 mg/kg IM every 12 hr	
				day 1	6.5(1)
				day 3 to 7	6.1-8.4(1)
				3 mg/kg IM every 12 hr	
				day 1	10.0(1)
				day 3 to 7	9.8-10.4(1)
				4 mg/kg IM every 12 hr	
				day 1	10.2(1)
				day 3 to 7	13.2-14.2(1)
				1 mg/kg IV (in 3-5 min)	4.1-6.3(0.17)
				1 mg/kg IV (in 2 min)	13.4±7(0)
				2 mg/kg IV (in 1 hr)	10.8±1.6(1)
				2 mg/kg IV (in 0.5 hr)	16.56±6.8(0.05)
				2 mg/kg IV (in 2 min)	28.2±9.6(0)
				3 mg/kg IM (infants)	5.6-6.9 (0.5)
				4 mg/kg IM (infants)	7.8-8.4 (0.5)
				4 mg/kg IV (infants)	8.5 (0.5)

TABLE II

ANTIBIOTIC	ANTIBIOTIC RANGE USUALLY TESTED Agar Dilution (mcg/ml)	Broth Dilution (mcg/ml)	APPROX. MIX FOR SUSCEPTIBLE MCG/ML	DOSE AND ROUTE	BLOOD LEVEL mcg/ml (time after dose - hrs)
Penicillin G, aqueous*	0.1, 1, 2, 8	.04-25	≤0.1 non-penicillinase-producing staphylococci	1,000,000 U IM	12(0.5)
				0.5 gm IV/hr (continuous)	16 (at equilibrium)
			≤1.5 (other organisms)	5,000,000 U IV (bolus)	400 (immediately after infusion)
Penicillin G, benzathine*	0.1, 1, 2, 8	.04-25	0.002-0.1	1,200,000 U IM	0.1 (24)
Penicillin V*	0.1, 1, 2, 8	.04-25	0.0015-3.2	0.5 gm PO	3.4-4.6(0.5-1)
Pipercillin			≤25	0.5 g IM	4.9+0.4(0.5-0.83)
				1.0 g IM	13.3+0.8(0.5-0.83)
				2.0 g IM	30.2+1.9(0.5-0.83)
				1.0 g IV (bolus)	70.7+12.7(0=end of infusion)
				2.0 g IV (bolus)	199.5+37.4(0)
				4.0 g IV (bolus)	330.7+67.8(0)
				6.0 g IV (bolus)	451.8+21.8(0)
				15 mg/kg IV (bolus)	138+8.5(0)
				30 mg/kg IV (bolus)	205+104(0)
				60 mg/kg IV (bolus)	520+65.3(0)
Rifampin			0.1-0.5	8 mg/kg P.O.	11.54+0.81(2)
				12 mg/kg P.O.	16.0+0.86(2)
				16 mg/kg P.O.	24.58+2.06(2)
				600 mg P.O.	7.23 (1.5)

* 1.0 International Units Sodium Penicillin G equals

TABLE II

ANTIBIOTIC	ANTIBIOTIC RANGE USUALLY TESTED Agar Dilution (mcg/ml)	Broth Dilution (mcg/ml)	APPROX. MIC FOR SUSCEPTIBLE MCG/ML	DOSE AND ROUTE	BLOOD LEVEL mcg/ml (time after dose - hrs)
Tetracycline	1, 2, 4, 8	.04-25	0.1-3	0.25 gm PO	2.2(4)
				0.5 gm PO	3.25(4)
				0.25 gm IV	3.12(0.5)
				0.5 gm IV	12.5(0.5)
				0.25 gm PO q6H	4.07(1-5) on 5th day
				0.5 gm PO q6H	7.67(1-3) on 5th day
Ticarcillin	Tested as Carbenicillin	1.8-1000	<16 (for Proteus sp., E coli, Enterobacter)	1 gm IM	26.9-35(1)
				1 gm IV (in 3 min)	100(0.25)
			<128 (for Pseudomonas aeruginosa)	3 gm IV (in 5 min)	256(0.25)
				5 gm IV (in 5 min)	504(0.25)
Tobramycin	1, 2, 4, 8	.04-25	0.1-3 (usually < 1.5)	1.5 mg/kg IM	5.6(0.5-2)
Trimethoprim-Sulfamethoxazole (TMP-SXT)			<1 TMP	0.16 g TMP and 0.8 g SMX PO	1-2 TMP and 40-60 SMX (2-4)
			<50 SXT	0.16g TMP and 0.8 g SMX IV (in 2 hr) every 8 hr	First dose: 3.4±0.3 TMP 46.±3 SMX(0) 4th Day: 8.8±0.9 TMP 105±11 SMX(0)
Vacomycin	Disc done by consult only	.04-25	0.2-5	0.5 gm IV	10(2)
				1 gm IV	25-33(0.02-2)
				2 gm IV	50(2)

NOTE: Second and third generation cephalosporins are done by disc diffusion upon consult with the Microbiology Laboratory

TABLE III
SEROLOGY

TEST	SUBMIT	NORMALS
Adenovirus Complement Fixation (CF)	1 ml serum, Red top tube, Convalescent specimen required, SF 557	Less than 1:8
*Amebiasis Indirect Hemaggulatination (IHA)	1 ml serum, Red top tube, SF 557	Negative
Antidesoxyribonuclease B (DNase B)	2 ml serum, Red top tube, SF 557	Preschool Age, less than 1:60 School Age, less than 1:170 Adult, less than 1:8
Antimicrosomal (MA) IHA	1.5 ml serum, Red top tube, SF 557	Less than 1:100
Antistreptolysin (ASO)	2 ml serum, Red top tube, SF 557	Preschool Age, less than 1:60 School Age, less than 1:170 Adult, less than 1:8
Antithyroglobulin (TA) IHA	1.5 ml serum, Red top tube, SF 557	Less than 1:100
Aspergillosis CF Immunodiffusion (ID)	1.5 ml serum, Red top tube, SF 557	CF, less than 1:8 ID, Negative
Bacterial Agglutinations	See Febrile Agglutinins	
Blastomycosis CF ID	1.5 ml serum, Red top tube SF 557	CF, less than 1:8 ID, Negative

TABLE III

TEST	SUBMIT	NORMALS
Bordetella pertussis Agglutination	1 ml serum, Red top tube SF 557	Negative
Brucella abortus Agglutinin	1 ml serum, Red top tube, SF 557	Less than 1:80
California encephalitis CF	1 ml serum, Red top tube, Conval. serum required, SF 557	Less than 1:8
Candidiasis Immunodiffusion (ID)	1 ml serum, Red top tube, SF 557	Negative
Chlamydia Group CF (psittacosis-LGV)	1 ml serum, Red top tube, Conval. serum required, SF 557	Less than 1:8
Coccidioidomycosis CF Immunodiffusion (ID)	1.5 ml serum, Red top tube, SF 557	CF, less than 1:8 ID, Negative
Cold Agglutinin	1.5 ml serum, Red top tube, SF 557	Less than 1:32
Colorado Tick Fever CF	1 ml serum, Red top tube, Conval. serum required, SF 557	Less than 1:8
Complement	See Total Serum Complement Level	
Coronavirus CF	1 ml serum, Red top tube, Conval. serum required, SF 557	Less than 1:8
Coxsackie A 2,4,7,10,16 CF	1 ml serum, Red top tube, Conval. serum required, SF 557	Less than 1:8

TABLE III

TEST	SUBMIT	NORMALS
Coxsackie B 1-6 CF	1 ml serum, Red top tube, Conval. serum requied, SF 557	Less than 1:8
C-Reactive Protein (CPR)	1 ml serum, Red top tube, SF 557	Negative
Cryptococcus Antigen	1.5 ml serum or, 1.5 ml CSF SF 557	Negative
Cytomegalovirus CF (CMV)	1 ml serum, Red top tube, Conval. serum required, SF 557	Less than 1:8
Dengue Fever CF	1 ml serum, Red top tube Conval. serum required, SF 557	Less than 1:8
Echovirus 4 CF	1 ml serum, Red top tube, Conval. serum required, SF 557	Less than 1:8
Epstein-Barr Viral Capsid Antigen (EB-VCA)-Indirect Fluorescent Antibody (IFA) (VCA-viral capsid antigen)	1.5 ml serum Red top tube, SF 557	< 1:10 (Age dependent)
EBNA and Early Antigens done upon consult ONLY		
Equine Encephalitis CF	1 ml serum, Red top tube, Conval. serum req, SF 557	Less than 1:8
FAMA (Varicella IFA)	1 ml serum, Red top tube, req, SF 557	Immune status: 1:8 or greater

TABLE III

TEST	SUBMIT	NORMALS
Febrile Agglutinations: Widal (Salmonella O, H, A, B) Weil-Felix (OX2, 19, K) B. abortus (Undulant Fever) Tularemia	2 ml serum, Red top tube, Specify group to be treated, SF 557	Less than 1:80
Fluorescent Treponemal Antibody-Adsorption (FTA-ABS)	2 ml serum, Red top tube, SF 557	Nonreactive
Fungal Serology: CF and ID for Histoplasmosis Blastomycosis Coccidioidomycosis Aspergillosis	2 ml serum, Red top tube, SF 557	CF: Less than 1:8 ID: Negative
Herpes Simplex CF	1 ml serum, Red top tube, Conval. serum req, SF 557	Less than 1:8
Herpes Zoster CF	1 ml serum, Red top tube, Conval. serum req, SF 557	Less than 1:8
Heterophile Antibody: Monotest	1.5 ml serum, Red top Tube, SF 557	Nonreactive
Histoplasmosis CF Immunodiffusion	1.5 ml serum, Red top tube, SF 557	Less than 1:8 Negative
Infectious Mononucleosis	See Heterophile	
Influenza A, B, C CF HI	2 ml serum Red top tube, Conval. serum req, SF 557	 Less than 1:8 Less than 1:10
Latex Fixation	See Rhuematoid Arthritis	
Legionellae pneumophilia (IFA) Sero Group 1-6	2 ml serum, Red top tube, SF 557	Less than 1:64

TABLE III

TEST	SUBMIT	NORMALS
Leptospira Agglutination	2 ml serum, Red top tube, SF 557	Negative
Lymphocytic choriomeningitis (LGM) CF	1 ml serum, Red top tube, Conval. serum req, SF 557	Less than 1:8
Lymphogranuloma venereum (LGV) CF	1 ml serum, Red top tube, Conval. serum req, SF 557	Less than 1:8
Malaria Indirect Immunofluorescence (IFA)	2 ml serum Red top tube Med Lab Form 101 SF 557	Negative
Measles	See Rubeola	
Microsomal Antibody (MA) IHA	1.5 ml serum, Red top tube, SF 557	Less than 1:100
Monotest Screening Test	See Heterophile	
Mumps CF HI	1.5 ml serum, Red top tube, Conval. serum req, SF 557	Less than 1:8 Less than 1:10
Mycoplasma pneumoniae CF	1 ml serum Red top tube, Conval. serum req, SF 557	Less than 1:8
Ox Cell Hemolysin	1.5 ml serum Red top tube, SF 557	Less than 1:40
Parainfluenza 1,2,3,4 CF	1 ml serum, Red top tube, Conval. serum req, SF 557	Less than 1:8

TABLE III

TEST	SUBMIT	NORMALS
Poliovirus 1,2,3 CF	1 ml serum, Red top tube, Conval. serum req, SF 557	Less than 1:8
Psittacosis CF	1 ml serum, Red top tube, Conval. serum req, SF 557	Less than 1:8
Q Fever CF	1 ml serum, Red top tube, Conval. serum req, SF 557	Less than 1:8
Rapid Plasma Reagin (RPR)	2 ml serum, Red top tube, SF 557	Nonreactive
Reovirus CF	1 ml serum Red top tube, Conval. serum req, SF 557	Less than 1:8
Respiratory Syncytial (RS) CF	1 ml serum, Red top tube, Conval. serum req, SF 557	Less than 1:8
Rheumatoid Arthritis:	2.5 ml serum,	
Screening Test	Red top tube,	Negative
Latex tube	SF 557	Less than 1:80
Rose-(Sensitized Sheep Cells)		Less than 1:40
Rocky Mountain Spotted Fever (RMSF) CF	1 ml serum, Red top tube, Conval. serum req, SF 557	Less than 1:8
Rose Test (Sensitized Sheep Cell Test)	See Rheumatoid Arthritis	
Rubella EIA	1. 5 ml serum, Red top tube,	Immune Status: 1,000 or greater
CF	Conval. serum req, SF 557	Less than 1:8

TABLE III

TEST	SUBMIT	NORMALS
Rubeola CF HI	1.5 ml serum, Red top tube, Conval. serum req, SF 557	Less than 1:8 Less than 1:10
Streptococcus MG Agglutinins	1.5 ml serum Red top tube, SF 557	Less than 1:20
Syphilis Serology (STS): RPR VDRL FTS-ABS	2 ml serum or, 2 ml Spinal Fluid, Red top tube, SF 557	 Nonreactive Nonreactive Nonreactive
TORCH	See Toxo, Rubella, CMV and Herpes Simplex	
Typhoid Agglutinins (Widal) Salmonella O,H,A,B	2 ml serum, Red top tube, SF 557	Less than 1:80
Typhus CF	1 ml serum, Red top tube, Conval. serum req, SF 557	Less than 1:8
Thyroglobulin Antibody (TA)	1.5 ml serum, Red top tube, SF 557	Less than 1:100
Total Serum Complement Level	4 ml serum, Red top tube, Serum must be frozen, SF 557	90-94%
Toxoplasmosis IFA IHA	2 ml serum, Red top tube, SF 557	Less than 1:256 Less than 1:256
*Trichina Agglutinin	1 ml serum, Red top tube, SF 557	Negative

TABLE III

TEST	SUBMIT	NORMALS
Tularemia Agglutinin	1 ml serum, Red top tube, SF 557	Less than 1:80
Vaccinia CF	1 ml serum, Red top tube, Conval. serum req, SF 557	Less than 1:8
Varicella CF EIA (FAMA)	1 ml serum, Red top tube, Conval. serum req, SF 557	Less than 1:8 Immune Status: 1:8 or greater
VDRL	2 ml serum, Red top tube, SF 557	Nonreactive
Widal (Salmonella O,H,A,B)	1.5 ml serum, Red top tube	Less than 1:80
Weil-Felix Agglutinins (Proteus OX_2, 19,K)	2 ml serum, Red top tube, Conval. serum req, SF 557	Less than 1:80
Yellow Fever CF	2 ml serum, Red top tube, Conval. serum req, SF 557	Less than 1:8

* Done at WRAIR, 576-3545

TABLE IV
REQUISITION SLIPS/TIME REQUIRED
TO COMPLETE MICROBIOLOGY TESTS

TESTS	FORM NO.	TIME
Gram Stain	WRAMC 1618-1	
Culture	WRAMC 1618	
Throat		24 hrs
Sputum		24 hrs
Wound		4 days
Body Fluid		4 days
Urine		24 hrs
Cath Urine		48 hours
Blood		7 days
Urethral, Vaginal, etc.		72 hours
Stool		48 hours
Anaerobic		Varies
Special Antibiotic Assays (Consult required)		7 days 24-36 hrs
TB Smear	SF 554	24-48 hrs
TB Culture	SF 554 (Separate form required)	8 wks
Mycology Smear (KOH, Wet Prep, India Ink)	SF 554	24 hrs
Mycology Culture	SF 554	6 wks
Parasitology		
O&P	SF 552	24-48 hrs
Gross Stool Exam	SF 552	24-48 hrs
Malaria	SF 552	24-48 hrs
Serology	SF 551/SF 557	24-48 hrs (Comp Fixation Weekly)

TABLE V

Viral and Related Diseases and
Clinical Materials Submitted for Laboratory Diagnosis

ILLNESS	VIRAL OR OTHER AGENT	SPECIMENS TO BE COLLECTED
	Respiratory Diseases	
Upper Respiratory Illness	Parainfluenza Adenoviruses Rhinoviruses Respiratory syncytical Echoviruses Coxsackie A-21 *Mycoplasma pneumoniae* Reoviruses	Throat washing Stool Paired sera
Exudative tonsillopharyngitis	Adenoviruses EB virus of infectious mononucleosis	Throat washing Stool Paired sera
Acute lymphonodular pharyngitis	Coxsackie A-10	Throat washing Stool Paired sera
Pharyngoconjunctival fever	Adenoviruses	Throat washing Stool Paired sera
Herpangina, stomatitis and/or pharyngitis	Coxsackie Group A *Herpes simplex*	Throat washing Stool Paired sera Swab of oral lesions
Bronchiolitis	Influenza Parainfluenza Adenoviruses *Mycoplasma pneumoniae* Respiratory syncytial	Throat washing Stool Paired sera
Laryngotracheobronchitis (croup)	Parainfluenza Influenza Rhinoviruses Respiratory syncytial Adenoviruses *Mycoplasma pneumoniae*	Throat washing Stool Paired sera
Pneumonia	Respiratory syncytial Adenoviruses Influenza, Parainfluenza Rubeola Varicella Psittacosis *Mycoplasma pneumoniae*	Throat washing Sputum Acute phase blood Paired sera

TABLE V

ILLNESS	VIRAL OR OTHER AGENT	SPECIMENS TO BE COLLECTED
Influenza	Influenza A, A-1, A-2, B, C	Throat washing (must be frozen immediately) Paired sera Postmortem lung
Pleurodynia (Bornholm disease)	Coxsackie Group B	Throat washing Stool Paired sera Pleural effusion
Genito-Urinary Tract Infections		
Viruria	Echoviruses Coxsackie Group B Adenoviruses Mumps Cytomegalovirus Rubeola Rubella Vaccinia Herpes simplex	Urine Paired blood
Vulvovaginitis	Coxsackie Group B Herpes simplex Lymphogranuloma venereum	Vaginal swab Lesion scraping Paired blood
Central Nervous System Diseases		
Paralytic disease	Poliovirus types 1, 2, 3 Coxsackie A-7, A-9 ECHO types 2 and 9	Throat washing Stool Cerebrospinal fluid Paired sera Postmortem brain and cord
Aseptic meningitis	Poliovirus Coxsackie Groups A and B ECHO viruses Herpes simplex Mumps Lymphocytic chorio-meningitis Lymphogranuloma venereum Psittacosis	Throat washing Stool Cerebrospinal fluid Paired sera Postmortem brain and cord

TABLE V

ILLNESS	VIRAL OR OTHER AGENT	SPECIMENS TO BE COLLECTED
Guillian-Barre Syndrome	Coxsackie Group A ECHO viruses	Throat washing Stool Cerebrospinal fluid Paired sera Postmortem brain and cord
Meningoencephalitis	Western encephalitis Eastern encephalitis St. Louis encephalitis California encephalitis Mumps Measles	Throat washing Stool Cerebrospinal fluid Paired sera Postmortem brain and cord Acute phase clotted blood for isolating encephalitis viruses
Subacute sclerosing panencephalitis (Dawson's encephalitis)	Rubeola	CSF Blood Postmortem brain
Toxic encephalopathy (Reye's Syndrome)	Unknown	Throat swab Stool Blood Postmortem liver, spleen, lung, brain, intestinal contents, blood
	Opthalmic Diseases	
Ocular herpes	Herpes simplex	Eye washing Throat washing Paired sera
Epidemic keratoconunctivitis	Adenovirus type 8	Eye washing Throat washing Paired sera
Trachoma	Trachoma agent	Eye washing Throat washing Paired sera Tarsus scrapings
Inclusion blenorrhea	TRIC agents	Eye washing Throat washing Paired sera Tarsus scrapings
Conjunctivitis	Newcastle disease virus Adenovirus	Eye washing Conjunctival scrapings Paired sera

TABLE V

ILLNESS	VIRAL OR OTHER AGENT	SPECIMENTS TO BE COLLECTED
	Exanthematous Diseases	
Herpangia	Coxsackie Group A	Throat washing Stool Vesicle fluid Paired sera
Hand, Foot and Mouth disease	Coxsackie Group A types 5, 10, 16	Throat washing Stool Vesicle fluid Paired sera
Chickenpox-Zoster	Varicella	Throat washing Vesicle fluid Paired sera
Herpes Simplex	Herpes Simplex	Vesicle vluid Throat washing
Vaccinia-Smallpox	Vaccinia, Variola	Vesicle fluid Throat washing Acute phase clotted blood Paired sera Postmortem liver and spleen
Dengue Fever	Dengue Virus types 1-4	Acute phase clotted blood Paired sera
	Cardiovascular Diseases	
Myocarditis and pericarditis	Coxsackie Group B	Throat washing Stool Paired sera Postmortem heart
	Miscellaneous Diseases	
Cytomegalic inclusion disease	Cytomegalovirus	Saliva Urine Paired sera
Mumps	Mumps	Urine Throat washing Paired sera
Orchitis and epididymitis	Mumps Coxsackie B	Urine Throat washing Paired sera Stool

TABLE V

ILLNESS	VIRAL OR OTHER AGENT	SPECIMENS TO BE COLLECTED
Intussusception	Adenoviruses	Stool Mesenteric lymph node Paired sera
Lymphogranuloma venereum	LGV agent	Lesion fluid and pus
Colorado tick fever	CTF virus	Acute phase clotted blood Paired sera
Infantile diarrhea (enteritis)	Echoviruses Coxsackie Group B	Throat washing Stool Paired sera
Nonspecific febrile illness	Polio Coxsackie Groups A and B Echoviruses	Throat washing Stool Paired sera
Postperfusion syndrome	Cytomegalovirus EB virus	Acute phase blood Paired sera
Acute infection lymphocytosis	Coxsackie-like virus EB virus	Throat washing Paired sera
Gastroenteritis (Rota virus)	Rota virus	Stool (call Microbiology for special handling)

DIAGNOSTIC IMMUNOLOGY

GENERAL INFORMATION

The Diagnostic Immunology Section is a fairly recent addition to the Department of Pathology and Area Laboratory Services and represents our attempt to consolidate those laboratory studies utilized in the evaluation of humoral and cell mediated immunity. Significant expansion in the services offered is planned for the near future. Contributors will be notified of new procedures as they become available. Diagnostic Immunology is located in Room 2B73, Bldg #2, telephone 576-1266.

TABLE I

DIAGNOSTIC IMMUNOLOGY

ANALYSIS	SPECIMEN TYPE	REQUIRED QUANTITY	NORMAL RANGE	INSTRUCTIONS
Alpha-1-Antitrypsin	Serum	2 ml	85 - 213 mg%	Refrigerated or frozen
Antinuclear Antibodies (ANA)	Serum/ Body fluids	2 ml	Negative 1:40 dil.	Refrigerated or frozen
Anti-nDNA	Serum/ Body fluids	2 ml	Negative 1:10 dil.	Frozen; patient must have a postive ANA
Antimitochondrial Antibody (AMA)	Serum/ Body fluids	2 ml	Negative 1:10 dil.	Refrigerated or frozen
Antismooth Muscle Antibody (ASMA)	Serum/ Body fluids	2 ml	Negative 1:10 dil.	Refrigerated or frozen
Ceruloplasmin	Serum	2 ml	18 - 45 mg%	Refrigerated or frozen
Complement				Specimen must be received
C_3	Serum/	2 ml	83 - 177 mg%	frozen. Inhouse samples must
C_4	Body fluids		15 - 45 mg%	be delivered to the Lab
CH_{100}			Reported with results	immediately after drawn
Cryoglobulin	Serum	3 ml	Negative	Immediately after drawing place in 37°C water bath and allow blood to clot for 30 minutes. Immediately remove serum. Ship specimen refrigerated or frozen.
Cryofibrinogen	Plasma (EDTA)	3 ml	Negative	Same as Cryoglobulin (above)
Extractable nuclear Antigen SM:RNP	Serum/ Body fluids	2 ml	Negative	Only done if ANA is positive
Haptoglobin	Serum	2 ml	27 - 139 mg%	Refrigerated or frozen
Hemoglobin Electrophoresis	Whole Blood	5 - 7 ml	Hgb AA	Refrigerated
A_2			1.6 - 3.6 %	"DO NOT FREEZE"
Fetal			Up to 2% for adults	

TABLE I

ANALYSIS	SPECIMEN TYPE	REQUIRED QUANTITY	NORMAL RANGE	INSTRUCTIONS
Immuno-Electrophoresis	Serum/ Body fluids	3 ml	Normal pattern	Done only on consultation unless M-spike is detected on SPE. Contact DI 61266.
Bence-Jones Protein by Immunoelectrophoresis	Urine	50 ml	Negative	Refrigerated or frozen
Immunoglobulins				
IgG	Serum/ Body fluids	3 ml	693 - 1670 mg%	Avoid hemolysis. Refrigerated or frozen. Normal ranges for children listed in Table II
IgA			56 - 390 mg%	
IgM			48 - 258 mg/%	
			(Adult serum values)	
CSF IgG	Spinal fluid	2 ml	None established	Ship in plastic container refrigerated or frozen.
L.E. Prep	Whole blood	10 ml Heparinized (Green top tube)	Negative	Performed ONLY if ANA is positive within last 2 weeks. Forward sample immediately to the Lab before 1200 hours.
Protein Electrophoresis				
Serum (SPE)	Serum	2 - 3 ml	Reported with results	Refrigerated or frozen
Urine (UPE)	Urine	50 ml	No pattern after electrophoresis	Refrigerated or frozen
Spinal Fluid (CSFE)	Spinal fluid	All available sample	Reported with results	Refrigerated or frozen. Ship in plastic container.
Body Fluid (BF)	BF	3 - 5 ml	Note established	Refrigerated or frozen
Protein, Total				
Serum	Serum	1 ml	5.6 - 8.4 gm%	Refrigerated or frozen
Urine	Urine	50 ml	< 0.07 gm/L	Refrigerated or frozen
Body Fluids	Body fluids	1 ml		Refrigerated or frozen

TABLE I

ANALYSIS	SPECIMEN TPE	REQUIRED QUANTITY	NORMAL RANGE	INSTRUCTIONS
Rheumatoid Factor	Serum/ Body fluids	2 ml	Negative 1:10 dil.	Refrigerated or frozen
Specific Gravity	Body fluids	1 ml		Refrigerated or frozen
T and B Cell Marker Studies: E-Rossette & Surface Ig's TdT Monoclonal Antibodies	Bone marrow, peripheral blood, lymph node, other tissue mass, spleen	Consult Lab	Reported with results	Consult Medical Director or Supervisor for approval prior to request (DI Lab, 61266).
Glycosylated Hemoglobin (A_1 C Hgb)	Whole Blood (EDTA)	3 - 5 ml	5.6 - 7.6 %	Refrigerated "DO NOT FREEZE"
Viscosity	Serum	5.5 ml	1.4 - 1.8 centistrokes	Refrigerated or frozen

TABLE II

NORMAL SERUM LEVELS FOR IMMUNOGLOBULINS ACCORDING TO AGE
(Allansmith, M., Journal of Pediatrics, February 1968)

Age	IgG mg/100 ml	IgA mg/100 ml	IgM mg/100 ml
2-4 months	362 (141-930)	17 (5-64)	44 (14-142)
5-8 months	433 (250-1,190)	34 (10-87)	62 (24-167)
9-14 months	633 (322-1,245)	40 (17-94)	80 (30-212)
15-23 months	863 (466-1,600)	63 (22-178)	81 (35-189)
2-3 years	808 (400-1,620)	71 (27-192)	83 (14-168)
3 1/2 - 4 1/2 years	963 (615-1,505)	100 (42-238)	92 (31-272)
5-6 years	976 (625-1,530)	121 (44-334)	86 (38-197)
7-8 years	1,010 (615-1,655)	102 (42-288)	73 (24-225)
9-10 years	1,090 (766-1,560)	142 (46-435)	85 (35-208)
11-12 years	1,095 (727-1,650)	150 (44-508)	73 (22-237)
13-14 years	1,090 (840-1,390)	172 (59-505)	82 (37-183)
15-16 years	1,160 (879-1,540)	170 (61-420)	93 (38-223)
17-18 years	1,070 (686-1,680)	183 (80-419)	86 (26-281)
19-21 years	964 (655-1,420)	155 (47-508)	84 (37-191)
Adult	693 - 1670*	56 - 390*	48 - 258*

* WRAMC normal adult ranges (Nephelometry)

VETERINARY LABORATORY SERVICE

1. GENERAL INFORMATION: The Veterinary Laboratory Service supporting Walter Reed Army Medical Center is located in Building #2490, Fort Meade, Maryland. The Veterinary Laboratory Service provides a complete military veterinary service to include food chemistry, food microbiology, animal disease diagnosis and disease diagnosis of selected diseases of man which are generally transmitted from animal to man.

2. HOURS OF OPERATION: Laboratory normally operates from 0730-1600 hours, Monday through Friday. Rabies cases are tested 7 days per week.

3. TELEPHONE NUMBERS:

Monday through Friday, 0730-1600 hours - AV 923-2756
After duty hours and on weekends - AV 923-6336

4. EMERGENCY PROCEDURES FOR RABIES DIAGNOSIS: All rabies case specimens which arrive during normal duty hours will be tested as they arrive. For cases after normal duty hours and on weekends, the CQ at Fort Meade Laboratory should be contacted and all pertinent information concerning the case should be given. Such information as type of animal, mode of contact, whether human exposure, method of shipment to the laboratory and telephone numbers where the submitter can be reached.

5. SERVICES AVAILABLE:

a. Food Microbiology. Provides microbiological testing of dairy products, fresh meats, packaged goods and canned products.

b. Foodborne Illness Samples:

(1) A foodborne outbreak is defined as an incident in which (a) two or more persons experience a similar illness, usually gastrointestinal, after ingestion of a common food and (b) epidemiology analysis implicates the food as the common source of the illness. There are a few exceptions; one case of botulism or chemical poisoning constitutes an outbreak.

(2) The following organisms are those generally associated with foodborne outbreaks and all can be isolated by this laboratory:

(a) Staphlococcus
(b) Salmonella
(c) *Clostridium perfringens*
(d) Shigella
(e) E. coli
(f) *Vibrio parahaemalyticus*
(g) *Yersinia enterocolitica*
(h) *Clostridium botulinum*
(i) Campylobacter

(3) In addition, the following pathogens are suspected of being, but have not yet been determined to be etiologic agents in foodborne disease:

(a) Group D Streptococcus
(b) Citrobacter
(c) Enterobacter
(d) Klebsiella
(e) Pseudonmonas

(4) Confirmation of a foodborne outbreak is done only when certain criteria are met and those vary from organism to organism. For example, The National Center for Disease Control's guidelines for confirmation of foodborne staphylococcal disease outbreak require that one of the following conditions be met:

(a) Enterotoxin is detected in the epidemiologically implicated food.

(b) Organisms with the same phage type are isolated from the stools or vomitus of all ill patients and the implicated food and/or the skin or nose of the food handler, or

(c) Organisms in concentration greater than or equal to 10^5 per gram are isolated from the epidemiologically implicated foods.

(5) Depending on the circumstance (clinical symptoms, incubation time and type of food incriminated), materials collected for examination should include such items as (a) leftover food from incriminated or suspected meal(s) and (b) vomitus, stool or rectal swabs from patients (include serum of patients suspected of having botulism).

(6) Send suspected samples (bulk foods, in open containers, and clinical specimens) in sterile, wide-mouth, screw-cap containers, such as sterile 4 oz. plastic specimen containers with screw-cap, or sterile 4 oz. or 8 oz. wide-mouth glass jars with screw-cap. Place each sample in a separate container. Submit rectal swabs in transport medium (e.g., use Culturettes or Cary-Blair medium in screw-cap tubes). Submit 100 grams of each sample or whatever amount is available if less than 100 grams is present. Non-bulk foods packaged in unopened original containers should be submitted in their original containers.

(7) An exchange of information by telephone from the submitting station and the laboratory at the time the samples are collected and/or when the samples are shipped will aid the laboratory in receiving the shipment and planning the tests and may preclude some errors commonly made in collection and shipment of samples.

(8) The following information will be required in completing the Foodborne Illness Outbreak Investigation Form:

- Date and time of onset of symptoms for first case.

- Location/Activity/Unit associated with the outbreak.

- Medical Treatment Facility where patients were evaluated.

- Veterinary or Preventive Medicine Activity doing investigation:

  POC
  Phone Number.

- Place, date, time of food preparation.

- Place, date, time of food serving.

- Method of serving and holding food.

- Storage place and temperature of food.

- Incubation period: (*n =) Average; Maximum; Minimum.

- Duration of illness: (*n =) Average; Maximum; Minimum.

- Number of symptoms: (*n =) Nausea; Vomiting; Diarrhea without blood; Diarrhea with blood; cramps; fever; other.

- Laboratory results from locally examined specimens: type of specimen; examined for; result; date.

- Food Specific Attack Chart (need not accompany initial batch of specimens)

Food Served	Number of Persons Who Ate Specified Food				Number of Persons Who Did Not Eat Specified Food			
	Ill	Not Ill	Total	% Ill	Ill	Not Ill	Total	% Ill

- Food items incriminated.

- Other pertinent information.

- Name of veterinary official approving shipment; date approved.

- Name of preventive medicine official approving shipment; date approved.

*n = number of people who gave an answer used in the calculation of the average value; or who had at least one symptom.

c. Specimens for rabies antibody titration:

Rabies, SN	Serum, 2 ml
	CSF, 2 ml

d. Specimens for rabies virus isolation from suspected human exposures: Submit fresh brain material that has been refrigerated from time of brain removal until arrival at the laboratory.

e. Food Chemistry: The Veterinary Laboratory Service also tests fresh dairy products, fluid and cultured dairy products, ice cream and frozen desserts, meat and meat products and salads and prepared products.

f. Pesticide Samples: Pesticide analysis can be performed on food items, soil, feeds, fish, birds, tissue specimens and blood serum. Maintain at or below -12°C until they arrive at the laboratory, and send 450 grams of each except 5 ml of serum. When submitting water, maintain it at 0°C to 4°C and submit 1 to 4 gallons.

ANATOMIC PATHOLOGY SERVICE

1. GENERAL INFORMATION:

a. The Anatomic Pathology Service encompasses the Sections of Histopathology, Autopsy, Cytology, and Special Pathology (Electron Microscopy and Immunohistochemistry).

b. The Anatomic Pathology Service is located on the second floor in Building T-2, with an additional Cytology Section at Fort Meade, and the morgue in Building #2 (NMTF).

c. The hours of operation are routinely from 0745 to 1630 hours Monday through Friday. A pathology resident and staff pathologist on-call are available for services and problems that arise during non-duty hours. The on-call roster is available at the Information Desk and within the Office of the Chief, Department of Pathology and Area Laboratory Services.

2. AUTOPSY PATHOLOGY

a. Autopsies are performed by the Anatomic Pathology Service for the purposes of clarification of cause of death, delineation of extent of disease, evaluation of effects of therapy, medico-legal reasons, etc. It is the option of the attending physician to request that an autopsy be performed on patients at WRAMC. The permission form must be signed by the legal next of kin(s) and specific restrictions or special examinations should be clearly noted. The permission form is then sent to the Casualty Section in Patient Administration for authentication.

b. For those deaths in which there is a question as to whether or not the Medical Examiner should be notified, the Casualty Affairs Office (61127) should be contacted during duty hours. During non-duty hours and on weekends and holidays, the AOD or Medical Examiner's Office should be consulted. If the Medical Examiner has jurisdiction he may either assume responsibility for the case or relinquish responsibility to WRAMC.

c. Before an autopsy can be scheduled by the Anatomic Pathology Service, the patient's complete chart and authenticated autopsy permission form must be received. Scheduling of the autopsy is at the discretion of the Anatomic Pathology Service. On weekdays, the autopsy is performed on the same day if the completed autopsy permit is received by 1330 hours. If the permit is received after 1330 hours, the autopsy will be scheduled for the following day. There is normally no autopsy service after duty hours, on weekends and holidays; however, in certain circumstances, the autopsy may be performed at any time at the discretion of the Director of the Autopsy Service or the staff pathologist on-call. Autopsies cannot be performed until the autopsy permission is authenticated. It is the policy of the Department of Pathology and Area Laboratory Services that autopsies be performed as soon as possible after the arrival of the chart. Physicians interested in attending autopsies are encouraged to call in advance for the approximate time at which the autopsy will be performed. It is also advisable that a call be made to the morgue (576-1291/1292) to verify that the autopsy has begun.

d. The preliminary autopsy report of death will be submitted within two working days and the final report within sixty days with copies to be sent to the requesting department chief and PAD. Any and all questions relating to the Autopsy Service may be addressed to the Anatomic Pathology Service (576-2743).

e. If an autopsy is requested on a person who has expired someplace other than WRAMC, clearance and consultation must be obtained from either the Chief, Anatomic Pathology Service, or if after duty hours, from the staff pathologist on-call prior to shipment of the body.

3. SURGICAL PATHOLOGY

a. All tissues from patients at this institution must be examined by the Department of Pathology and Area Labortory Services at WRAMC. This is done by submission of the tissue in a properly labeled container with the patient's name, Social Security Number, ward or clinic, and physician's name. A properly completed SF-515 (Tissue Examination Form) must be submitted with the specimen.

b. All urgent specimens requiring rapid turnaround time for direction or initiation of therapy should be designated with the word "RUSH" written across the SF-515. Pick-up of surgical specimens from the Operating Room is made two times a day at 0800 and between 1200-1300 hours. Any "RUSH" specimens removed after the second pick-up must be hand carried to the Anatomic Pathology Service in Building T-2 by the submitting service prior to 1600 hours if the specimen is to be processed that day. This service is not available on weekends. The "RUSH" specimen service should not be abused and physicians are encouraged to use this service only in cases in which patient care will be affected by a rapid turnaround time.

c. Routine surgical specimens are collected from the Frozen Section Room, Front Desk Clinical Path Laboratory and Anatomic Path Laboratory. Copies of the pathology reports should be ready for distribution within 4 working days of receipt of the specimen, except for cases requiring special study or consultation. If a delay is expected, a preliminary report will be issued within 36 hours.

d. Review of Slides on Patients Transferred to WRAMC

(1) The Surgical Pathology Section must review the slides that accompany all patients to WRAMC when referred from other hospitals. The slides and a copy of the original pathology report must be delivered to the Anatomic Pathology Service where they will be accessioned. They will then be reviewed by the appropriate resident and staff and consultation reports rendered. The Surgical Pathology report from the referring institution, together with a properly completed SF-513, should accompany the slides.

(2) To request a review of outside slides submit a completed SF-513 to include the patient's name, Social Security Number, date tissue was obtained, and referring hospital, to the Anatomic Pathology Service.

Completed DD Form 2005 should be signed by the patient and accompany the SF-513. The Anatomic Pathology Service will then obtain the material from the originating pathology department, render an interpretation, and return the slides.

e. Surgical Pathology report diagnosis can be obtained by calling 576-3101, 3102, 3103. Diagnosis on cases referred into WRAMC (consult cases) can be obtained by calling 576-2890.

f. Housestaff are encouraged to review the slides on their patients' specimens with the pathology residents.

4. SPECIAL PROCEDURES

a. Frozen Section:

(1) The purpose of the frozen section is to direct therapy and assist the surgeon or physician in making an intra-operative decision on patient management. If there is no immediate consequence to patient management, frozen section is not indicated. Because of the freezing artifact introduced during this procedure, it should be avoided in all situations when not needed, especially if only a small piece of tissue is available for the permanent section preparation following the procedure. Limits to information that can be obtained from frozen section are present and diagnoses demanding evaluation of possible subtle alterations in microscopy cannot be made with certainty on frozen section.

(2) The SF-515 must accompany tissue for frozen section examination. Adequate clinical information should be available together with patient's name, Social Security Number, ward or clinic, date, and requesting physician.

(3) Requests for frozen section evaluations during duty hours should be placed when tissue is surgically removed by calling 62743 or 62744. After duty hours, from 1630 to 0800 hours weekdays, on weekends and holidays, the paging service at 61000 will contact resident/staff frozen section team on-call.

(4) Frozen section diagnosis is rendered to the clinician immediately upon completion of examination by staff pathologist.

b. Special Handling of Tissue:

(1) Unless otherwise indicated, all tissue submitted to the Anatomic Pathology Service should be submitted completely covered in 10% phosphate buffered formalin. If other studies such as touch preps, culture, electron microscopy, immunofluorescence, etc. are to be performed, appropriate handling does not include formalin fixation. Questions concerning the handling of the tissue for these studies should be directed to the Anatomic Pathology Service.

(2) Lymph nodes and other specimens requiring bacteriological examination should be divided on the sterile field at surgery and a portion placed in a sterile container and submitted to Microbiology Section. If

bacteriological examination is desired, this portion must not be placed in formalin. The remaining portion can be put in formalin and submitted to Surgical Pathology.

(3) Electron microscopic examination may be obtained after consultation with the Anatomic Pathology Service. Electron microscopic studies are routinely performed on kidney biopsy material.

(4) Tissue immunofluorescent studies are routinely done on fresh and unfixed renal biopsies and skin biopsies. Immunohistochemical stains on fresh or fixed tissues are done when requested or indicated.

(5) All other surgical specimens, if not placed in formalin, should be immediately brought to the Anatomic Pathology Service during regular working hours. If a special procedure is requested on a specimen at other than duty hours, the appropriate resident or pathologist on-call should be consulted for proper handling of the specimen.

5. ELECTRON MICROSCOPY

a. The Anatomic Pathology Service has an active electron microscopy unit in the Special Pathology Section. All renal biopsies are routinely examined. In addition, other tissues or specimens of interest can be processed for electron microscopy. This process requires careful handling, including immediate fixation in special fixative available in Anatomic Pathology, Special Pathology Section. For this reason, when electron microscopy is required, contact the Special Pathology Section (576-2234), or an appropriate member of the Anatomic Pathology Service before the biopsy is done. This is to insure proper handling.

b. All tissue submitted for ultrastructural examination should be properly labeled with the following items:

(1) Patient's name
(2) What the specimen represents
(3) Physician's name
(4) Exact time and date of excision

c. Specimens must be accompanied by a properly completed SF-515 (Tissue Examination Form).

d. The Anatomic Pathology Service should be consulted before submitting specimens for electron microscopy in all cases.

6. ESTROGEN AND PROGESTERONE RECEPTOR ASSAY (Tissue)

a. This procedure is offered by the Anatomic Pathology Service through a contract with a commercial laboratory. The submitted specimen must be fresh primary or metastatic tumor, proven by frozen section examination. A minimum of one gram of fresh tumor tissue is needed. The receptors are very labile and the specimen must be collected and transported according to rigidly defined criteria. The tissue must be brought to the laboratory within 15

minutes following surgical resection or to the frozen section room for proper preparation. The specimen must not be placed in formalin or other preservatives. If any of its freezing conditions are not met, the result may not be valid.

b. A properly completed SF-515 must accompany the specimen. Any questions concerning the proper handling of the tissue should be directed to the Anatomic Pathology Service.

CYTOLOGY

1. GENERAL INFORMATION

a. The following guidelines for the handling and collecting of specimens have been drawn up by the Cytology Section in the Anatomic Pathology Service to help the nursing staff and physicians. If these steps are followed, the laboratory will be able to give more meaningful diagnostic information.

b. Location: The Cytology Section for this Medical Center is located in Anatomic Pathology Service, Building T-2. The telephone extension is 576-2242.

c. Hours: The laboratory is open from 0745-1630 hours Monday through Friday.

2. SUBMITTING SPECIMENS TO THE LABORATORY

a. Labeling of Specimens: All specimens must be submitted in a properly labeled container to include the patient's name, SSN, physician's name and clinic or ward.

b. All slides submitted (GYN smears, bronchial brush smears, nipple smears, tumor aspirate smears, etc.) must be identified by writing the patient's name and Social Security Number on the frosted end with a #3 lead pencil.

c. Standard Forms:

(1) All specimens must be accompanied by a properly and completely filled out Standard Form. All forms must include the patient's name, SSN, date, physician's name (legibly written), clinic or ward, patient's age, sex, specimen source and pertinent clinical history and physical findings.

(2) All GYN pap smears must be accompanied by a completed Standard Form 541 (Cytology Form).

(3) All non-Gyn specimens must be accompanied by a complete Standard Form 515 (Tissue Examination Form).

d. Delivery of Specimens:

(1) Specimens are to be delivered to the cytology or clinical laboratory during duty hours. During non-duty hours non-fixed specimens should be obtained only if absolutely necessary and refrigerated until they can be delivered during normal duty hours.

(2) It is strongly recommended that specimens be delivered to the laboratory as early in the day as possible to enable processing of specimens on the same day.

(3) CSF specimens should be submitted directly to the clinical laboratory (Hematology Section) for cytospin (see para 2m below).

e. Handling of Improperly Submitted Specimens: Those specimens submitted which are improperly labeled, not labeled, or labeled in a different manner than the SF-541 or SF-515, or incompletely filled out request forms, will be processed; however, the submitting physician will be immediately notified and the final pathologic report will not be issued until the submitting physician has corrected the deficiency.

f. Fixation and Staining:

(1) Cellular smear preparations (cervicovaginal, bronchial brush, esophageal and gastric brushings, nipple discharge) require immediate fixation in 95% ethanol fixative (Pap fixative) to eliminate drying artifact.

(2) Expectorated specimens (sputum) are to be sent fresh.

(3) All other routine cytologic specimens (body fluid, urine, esophageal wash, gastric wash, etc.) require no addition of fixative and should be sent immediately to the Cytology Section for processing to ensure a good morphologic preparation.

(4) Storage: If an unfixed specimen is obtained when the laboratory is closed, it must be refrigerated. Such a case should be the exception, however. On the morning of the next working day the specimen should be brought to the laboratory. The specimen should not be allowed to freeze. Specimens in fixative do not need refrigeration for storage.

(5) If a question arises as to how a specimen should be handled, please call Cytology at 576-2242.

(6) For processing of FNA, see para 2o below).

g. Esophagoscopy-Esophageal Washings:

(1) During direct esophagoscopy, rinse the lesion with 10-20 ml of normal saline.

(2) Aspirate saline into container, pack in ice, and deliver specimen directly to the Cytology Section.

h. Gastric Washings:

(1) Give the patient a soft meal the night before and water ad lib until one hour before the procedure.

(2) Pass a number 18 Levin's tube, aspirate and discard gastric fluids.

(3) Instill 500 cc of normal saline using a 100 cc syringe.

(4) Have the patient roll on his right side, back, and left side. In each position lavage stomach vigorously seven times. Ballot stomach.

(5) Empty stomach and place fluid in flask packed in ice.

(6) Deliver the specimen directly to the Cytology Section without fixative.

i. Bronchial Washings:

(1) Position the patient so that the bronchus in question is dependent.

(2) Fill the bronchus with normal saline.

(3) Aspirate and reinstill the saline several times.

(4) Aspirate all the fluid from the bronchus, label and send immediately without fixative to the Cytology Section. If there is any delay in forwarding specimen to the laboratory, place the fluid in refrigerator.

(5) Bronchial Brush Specimens: Smear brush on labeled glass slides quickly and fix immediately in 95% ethanol. Submit brush in separate tube with 70% ETOH for cell block.

j. Post-bronchoscopy Sputum:

(1) Give the patient a sputum cup before the bronchoscope is withdrawn.

(2) All sputum expectorated after bronchoscopy and for the next one hour should be collected.

(3) Send the specimen to the Cytology Section.

k. Sputum:

(1) The evening prior to specimen collection, the patient should be instructed as to proper technique. On first awakening in the A.M., the patient should cough deeply and expectorate into the sputum cup. Specimens obtained later in the day are of little diagnostic value.

(2) Any additional sputum from deep coughing after the initial specimen should be submitted in a separate sample. NOTE: Saliva is of no diagnostic value and should not be included in the specimen.

(3) Send the specimen to the Cytology Section.

(4) For maximum diagnostic accuracy, repeat for three consecutive days.

l. Pap Smear (Female Genital Tract):

(1) Prior to obtaining smear, identify slide by writing patient's name and Social Security Number on the frosted end with a lead pencil.

(2) Obtain cervical scraping from complete squamocolumnar junction by rotating spatula 360° around external OS, high up the endocervical canal. Utilize moistened cotton swab or endocervical aspirator to obtain endocervical specimen. Place both the endocervical and vaginal specimens on one slide (frosted surface side).

(3) Spread smear quickly across slide and fix immediately in 95% ETOH.

(4) For evaluation of adenosis, cervix and vagina should be free of mucus before smears are made. If four quadrant vaginal smears are submitted, each slide should be labeled as to site.

m. Spinal Fluid Cytology:

(1) Perform spinal tap.

(2) Send sample to Clinical Laboratory. There cytospin will be done for cytologic evaluation. SF 515 should accompany specimen requiring cytologic evaluation.

(3) It should be clearly stated if cytologic evaluation is necessary. The Hematology Section will provide white blood cell count and differentiation. Cytologic evaluation will provide information concerning presence of neoplasia.

(4) Samples for chemical and/or bacteriologic analysis are sent to the Clinical Laboratory.

n. Breast Specimens (Nipple Discharge and Needle Aspirate):

(1) Smears of nipple discharge should be fixed immediately in 95% ethanol, "Pap fixative."

(2) Aspiration specimens - Cyst fluid should be submitted unfixed to the Cytology Section. Refrigerate if after working hours and submit in morning.

o. Needle Aspirations of Tumors: Coordinate with the Cytology Section Supervisor, 576-2242, at least 24 hours prior to aspiration for scheduling. If preparation of specimen is to be done by your service, cytology should be notified for instructions regarding proper preparation of specimen.

p. Buccal Smears: Call Cytology Section, 576-2242.

3. Any specimen amenable to cytological study will be accepted by our Section. Unusual cases should be coordinated with the Medical Director, Cytology Section. If quesions arise as to how a specimen should be handled, please call Cytology at 576-2242. (For chromosomal studies, contact Clinical Pathology Service, 576-1044.)

DEPARTMENT OF RADIOLOGY

TABLE OF CONTENTS

GENERAL INFORMATION

ORGANIZATION: The Department of Radiology is composed of three services:

Diagnostic Radiology (61937)
Nuclear Medicine (65140)
Radiation Therapy (61180)

LOCATION OF FACILITIES:

Diagnostic Radiology

Main Section - 1X
Physical Exam/ER Subsection 1C60 and 1E61
Special Procedures (4th Floor, 4X)
CT - IG32
Cast Room - 4X
Portable Stations 4-7 Floors, 1X60
OR Room #15
GU Clinic Facilities 4F (See Excretory Program)
Oral Surgery ID (See Panorex and Sialography)
GI Clinic Fluoroscopy 7F (GI Clinic procedures only)
Cardiology Clinic

Nuclear Medicine

All facilities located 7A-B

Radiation Therapy

Basement Bldg T-2 (new quarters being prepared 1H)

REQUESTS FOR EXAMINATION

Diagnostic Radiology: All examinations are requested on SF-519A (3 part form). Patient's name, Social Security Number with family member prefix, military status, age, sex, requesting service code, examination requested, physician's signature and appropriate history are required by regulation and to assure delivery of report, and identification of patient and reason for examination.

Nuclear Medicine: Images requested on DA 4700.

Radiation Therapy: Consultation for therapy required.

DEPARTMENT OF RADIOLOGY TELEPHONE GUIDE:

Department Chief	61930/1931
Secretary	61930/1931
NCOIC	61930/1931
Administrator	61930/1931
Administration Room (Room 1X19)	61935/1936
Educational Coordinator	61980

Diagnostic Radiology Service	
Chief	61937/1938
Secretary	61937/1938
NCOIC	61958
Reception Lounge	61945
Appointments/Information	61922/1934
Word Processing (DMT)	61986
Diagnostic Staff	61927/1928
Diagnostic Residents	61939
Image Library	61951
Teaching Files	61948
Ultrasound	61954
Mammography	61954
CAT Scan	61943
Supply Log Techs	61985
Special Procedures, Chief	61937
Special Procedures Suite	62581/1491
Neuroradiology Chief	61937
Nuclear Medicine, Chief	65140
Appointments/Information	65140
Supply Med Tech	65140
NCOIC	65140
Laboratory Supervisor	65140
Admin Supervisor	65140
Radiation Therapy, Chief	61180/1181
Assistant Chief	61180/1181
Physics	61180/1181
Appointments/Information	61180/1181
Secretary	61180/1181

REPORT OF RESULTS

1. Diagnostic Radiology:

a. "Wet" (STAT) reports will be provided by request and as clinically indicated.

b. Patient handcarrying of reports is provided only as required for patient care.

c. Routine reports are delivered to File Room 1X71 from whence they are distributed.

2. Nuclear Medicine: Routine lab reports are distributed through Pathology. Same day "wet" reports of scans are available on the same day the scan was performed in "wet book" located in Nuclear Medicine during duty hours or front desk in Radiology during nonduty hours. Studies requiring computer processing will have a "wet report" the next afternoon.

FILM POLICIES:

1. Master jacket and reports never leave Diagnostic Radiology. Ultrasound, xerography, CT, nuclear medicine examinations are not to be removed at any time from their filing areas. Copies may be arranged.

2. Angiographic examinations remain in Special Procedures for 24 hours and are returned to the File Room 1X71.

3. All urology examinations are returned to the File Room 1X71 upon being reported within 24 hours.

4. All orthopedic (Cast Room) examinations are returned to Radiology File 1X71 at the end of the day.

5. All physical examinations/ER examinations are returned to File Room 1X71 no later than end of the day.

6. All transfer files are delivered to File Room 1X71 upon receipt.

7. Clinics, OR, conferences may request patient films (with exception of para 1) for review. Such requests must be received by the File Room by 1800 hours of the prior day. They will be delivered to the requesting service by telelift. All films are to be returned no later than the close of conference, 1630 hours, or close of clinic, whichever relieves immediate need of the film.

CLINICAL GUIDELINES FOR ROUTINE EXAMINATIONS:

Abdomen: Used to evaluate the bowel gas pattern and soft tissue structures of the abdomen. This is a single supine film which is centered over the mid-abdomen. This examination does not substitute for the KUB which is described below.

Abdomen, Supine and Erect (Flat and Upright): Used to evaluate the abdominal contents in cases of obstruction, ileus, and visceral perforation. The examination also includes a PA chest film which is used to evaluate for free air under the diaphragm, as well as to look into the chest for causes of referred pain.

A-C Joints: Used to evaluate the integrity of both acromino-clavicular ligaments, performed with and without weight-bearing stress applied to the joints. Symmetry is most important. The site of concern must be noted in the historical section. The clavicles and glenohemeral joints are not adequately evaluated with the A-JOINT examination.

A-C joint trauma is evaluated as follows: A 1^{o} separation is primarily a clinical diagnosis of pain localized to the A-C joint and possibly mild, soft tissue swelling. A 2^{o} A-C joint separation is demonstrated by an apparently normal A-C joint with non-weight bearing and diastatic A-C joint both with and without weight bearing.

Ankle: Used to evaluate the integrity of the distal tibia and fibula as well as the ankle mortise. The talus, calcaneus, tarsal navicular are also included, although the calcaneus has a special examination, the calcaneus or oscalcis view. The second row of tarsals as well as the metatarsals, are not adequately evaluated with the ankle examination. The best examination for these areas of interest is the foot examination.

Arthritic Survey: A limited and tailored examination primarily of the small bones of the hands and feet with additional views being obtained of other joints in the body which present as clinical sites of pain.

Arm: Refer to the humerus examination.

Calcaneus: Refer to the oscalcis examination.

Carpal-Tunnel: A specialized examination used primarily for the orthopedic evaluation of the carpal-tunnel at the wrist. This evaluation is not routinely performed when examining the hand or wrist.

Cervical Spine: Used to evaluate trauma or arthritic processes of the C-Spine and related adjacent soft tissues. "Oblique views" of the cervical spine to evaluate the integrity of the neural foramina are included in the examination when there are clinical indications of a cervical radioculopathy. The cervical spine examination is not the optimal examination for the evaluation of the soft tissues of the airway and adjacent structures in the neck which are best examined by a soft tissue neck examination.

Cervical Spine, Flexion Extension Views: Used to evaluate the integrity of the atlantoaxial ligaments and paravertebral ligaments in cases of trauma and rheumatoid arthritis. The examination should be added to the routine cervical spine examination.

Chest: Used to evaluate the cardiopulmonary status. This examination will additionally be helpful for evaluating for free air under the hemidiaphragm. The technique used for the chest examination is designed primarily for soft tissue evaluation and not bone detail. Therefore, the chest examination will not substitute for a rib series which uses a radiographic technique for optimal demonstration of bone detail. For the same reason, the chest examination will not substitute for a thoracic spine evaluation.

Apical Lordotic Chest: An examination of the pulmonary apices ordered by the radiologist in cases of suspected pathology. This is not a routine examination for the evaluation of possible involvement with the apices in disease states with an apical predilection, such as tuberculosis, and is only ordered after evaluation of the chest examination.

Clavicle: Also referred to as the collarbone; this examination is used to evaluate the integrity of the clavicle. There are separate sternoclavicular joint and acromioclavicular joint examinations to evaluate these areas of interest.

Elbow: Used to evaluate for traumatic injury or arthritic status of the elbow joint. The forearm and humerus examinations, although they include their respective articular surfaces at the elbow joints, do not adequate evaluate the integrity of the elbow joint. Survey examinations of the humerous and forearm cannot be used to exclude pathology within the elbow.

Facial Bones: Used to evaluate the structural integrity of the facial bones. The temporomandibular joints and the mandible examinations are designed for demonstrating this specific anomaly. The sinus series uses a bone examination. The facial bones examination is used additionally to evaluate trauma to the orbital floor, infraorbital rim, medial orbital wall and the orbital roof. Therefore, the facial bones examination will evaluate most of the traumatic conditions of the orbit. The orbit examination has an additional view to evaluate the lateral orbital wall. Neither the facial bones examination nor the orbit examination are useful for evaluating the optic foremen or nasal bones.

Femur: Used to evaluate the femur and includes both the femoral head and femoral condyles. The leg examination evaluates only the tibia and fibula and does not include the femur and thigh regions.

Fetogram: A specialized examination of the uterine contents performed after an ultrasound examination primarily for the confirmation of fetal demise.

Pelvimetry: A radiographic obstetrical examination of the shape and volume of the pelvis used for the evaluation of the maternal pelvis in cases of prolonged or complicated vaginal delivery.

Finger: Includes a PA view of the hand with multiple views of the finger of interest. The finger of interest should be designated descriptively as the thumb, index, middle, ring or 5th finger. Alternatively, the fingers can be designated by the numbers 1-5, remembering that the thumb is the first finger of the hand.

Foot: Used to evaluate the second row of tarsals, the metatarsals and the phalanges. Although the talus and the calcaneus are seen in the lateral view, the ankle examination is the means for evaluating the proximal rows of tarsals. Weight-bearing views of the foot must be ordered in pediatric patients in order to evaluate the congenital anomalies of the foot, and also in adults when evaluating for pes planus or other structural abnormalities.

Forearm: Used to evaluate the integrity of the radius and the ulna. Includes the articular surfaces of the elbow and the wrist joints but is not optimal for evaluating joint integrity. Separate wrist or elbow examinations should be ordered to evaluate these joint areas.

Hand: Used to evaluate the metacarpals and phalanges of the hand. Although the views include the distal forearm and carpal bones, the wrist examination or navicular series are the most appropriate examinations for evaluating traumatic or arthritic pathology in the carpals.

Hip: This includes an evaluation of the bone pelvis with additional detailed views of the hip(s) of interest.

Heel: This is a soft tissue examination used primarily to identify radiopaque foreign bodies and inflammatory status in the soft tissues about the oscalcis.

Humerus: Also referred to as arm, this examination evaluates the integrity of the humerus and includes the respective joint surface of the humeral head and epicondyles. This examination will not evaluate the shoulder or elbow regions, for which separate examinations have been designed.

Internal Auditory Canals: Used to evaluate for tumors of the 8th nerve and additionally provides anatomic information about the middle ear structures. This examination does not evaluate the mastoid tips and, therefore, is not interchangeable with the mastoid series.

Knee: Used to evaluate the structural integrity of the femoral condyles and tibial plateaus and for the detection of joint effusions. In cases of significant trauma, oblique views may be included to further evaluate the tibial plateaus and femoral condyles. Suspected loose bodies within the joint are better detected with the tunnel view which must be added to the routine knee exam. Examination of the patella is achieved by requesting a patella examination or with the addition of the sunrise view to the knee examination.

KUB: Used to evaluate the urologic structures primarily. This examination is centered lower in the abdomen than the supine abdomen examination and is performed at a lower KV technique to enhance the visualization of small radiopaque calculi. This examination is used primarily to search for suspected lithiasis in the GU system.

Leg: Also ordered as the tibia-fibula examination, the leg examination evaluates the integrity of the tibia and fibula. Although the proximal and distal articular surfaces of both the tibia and fibula are included on the examination, the joint surfaces are evaluated respectively with the knee or ankle examination.

Lumbar Spine: Also ordered as L-S spine, used to evaluate the integrity of the lumbar and sacral vertebral elements as well as the SI joints in the AP projection. Oblique views are not routinely performed but should be included in cases of trauma and ordered as lumbar spine with obliques.

Mandible: Used to evaluate the integrity of the mandible after trauma, primarily. The other facial structures are not well demonstrated with this examination. Additional information concerning the mandible may be obtained with a panorex examination performed through the Dental and Oral Surgery Departments.

Mastoid Series: Used to evaluate the bony external and middle ear structures in addition to the mastoid air cells.

Metabolic Bone Survey: Used to evaluate chronic metabolic electrolyte disorders. This is a tailored examination and is used to evaluate certain selective sites of bony involvement in metabolic disorders. An example would be the evaluation of the adductor surfaces of involvement seen in calcium and phosphorus metabolic disorders.

Metastatic Bone Survey: Like the metabolic bone survey, this is a tailored examination. A bone scan obtained from Nuclear Medicine Department must precede the bone survey to evaluate possible sites of involvement with metastatic neoplastic disease. This examination may be directed by clinical symptomatology in cases of negative bone scan. Plasmacytoma and multiple myeloma currently serve as the only exceptions to the use of the bone scan to direct the views to be taken for the metastatic bone survey.

Navicular Series: This is an examination of the carpals with special views of the carpal navicular in cases of trauma with pain present in the "anatomic snuff box." The wrist examination should be used to evaluate the carpals in cases involving other than traumatic injury to the region of the carpal navicular.

Nasal Bones: Used to evaluate the integrity of the nasal bones in cases of trauma. This examination also includes an evaluation of the anterior nasal spine. Because of significant technique differences, the facial bones examination will not give an adequate detailed examination for nasal bone trauma.

Neck: Also ordered as soft tissue neck. Used to evaluate the cervical airway an paracervical soft tissues in cases of inflammation, infection, and foreign body ingestion or aspiration. The neck examination will not adequately evaluate the bony structures of the cervical spine.

Optic Foramina: Used to evaluate the optic foramina for enlargement due to tumor or tumor-like states. This examination is most frequently confused with the orbit exam, and unlike the orbit or facial bones examination, will not evaluate the orbital walls.

Orbit: Used to evaluate the bony orbit. The lateral orbital wall is best evaluated with this examination, whereas, most orbital and periorbital facial trauma is adequately evaluated with the facial bones examination.

Os Calcis: Also referred to as the calcaneus examination. This is an examination of the bony detail of the oscalcis using a special AP view as well as a lateral view. This examination is helpful in cases of trauma or arthritic changes with pain referred to the region of the calcaneus. The heel examination is a special soft tissue examination used to evaluate for foreign bodies and soft tissue disease.

Panorex: Used by the Department of Dentistry to evaluate the tooth structures. Can be used to augment the evaluation of the mandible in cases of trauma. This examination is requested through Oral Diagnosis, 1D41.

Patella: A detailed examination of the patella including lateral and sunrise views. The knee examination does not include the "sunrise" view of the patella.

Pelvis: Used to evaluate the integrity of the bony pelvis. The examination of the pelvis is also included in the hip examination.

Portable Examinations: These are generally limited to the chest, abdomen and extremities in patients who are too ill to come to the Department of Radiology. The portable x-ray equipment has a much lower radiation output. Generally speaking, these examinations will give only gross information because of the difficulties in producing an optimum examination. This is not a convenience examination because of these limitations.

Ribs: A detailed examination of the ribs directed at the site of trauma or pain using radiographic bone technique. The examination includes a PA chest used to evaluate for hemothorax, pneumothorax and pulmonary contusion secondary to rib fracture. Because the chest is not obtained using bone technique, it will not substitute for the rib series.

Scapula: Used to evaluate trauma to the scapula and in suspected posterior dislocations of the shoulder. These are special views of the scapular portion of the shoulder girdle. Although the scapula is demonstrated on the shoulder examination, only the scapular examination gives a tangential view of this region of interest.

Shoulder: Used to evaluate the glenohumeral joint. Although a distal half to one-third of the clavicle is present on the examination, the clavicle exam should be used to evaluate clavicular trauma. The A-C joint examination is discussed above.

Sinus Survey: Used to evaluate the bony integrity and soft tissue lining of the paranasal sinuses. The radiographic technique and restricted area of viewing limits the evaluation of the adjacent facial bones, rendering the sinuses examination inadequate for evaluating trauma to the facial bones.

SI Joints: Used to evaluate the integrity of the sacroiliac joints in cases of suspected pathology. This examination is usually performed after or in conjunction with the LS spine examination. The examination is usually ordered at the request of the radiologist or in cases of suspected pathology localized to the sacroiliac joints.

Skull: Used to evaluate the neurocranium and intracranial contents. The x-ray penetration necessary to achieve a good skull examination does not allow for optimal examination of the facial bones, nasal bones, or paranasal sinuses. The examination is used pimarily to evaluate for trauma to the calvarium and for possible intracranial lesions.

Soft Tissue Examination: Any soft tissue part of the body may be examined radiographically for the evaluation of inflammatory state or the presence of foreign bodies. These examinations are generally tailored by the radiologist to the clinical site of interest and therefore require a detailed anatomic description and differential diagnosis.

Sternoclavicular Joints: Used to evaluate the integrity of the sternoclavicular joint and will view the proximal third of the clavicle. This examination does not adequately evaluate the sternum distal to the sternomanubrial joint nor the clavicle. See clavicle and sternum.

Tibia Fibula Examination: Refer to leg examination.

Toe: Includes a PA view of the foot with multiple views of the toe of interest. The toe of interest should be designated by the numbers 1 - 5. The first toe may also be designated as the "great toe."

Water's View: Used as a single view examination for the followup of previously demonstrated pathology confined to the maxillary sinuses. This examination is not to be used for the preliminary examination of the paranasal sinuses or facial bones.

Wrist: Used to evaluate for trauma or arthritic processes confined to the carpals. The exception to this examination is the navicular examination of the wrist, as described above.

Availability of routine examinations: All hours
Normal duty hours
Off duty hours by appointment only

Indications: Clinical evidence of disease

Method of request: Patient submission with appropriate request, SF 519A

Preparation required: None

BARIUM OR OTHER COMMON GI STUDIES:

Oral-Cholecystogram:
Availability: Normal duty hours
Indications:
1-Clinical evidence of gallstones or biliary disease
2-Diagnoses-RUQ pain, pancreatitis, unexplained evaluation of LFTs, bilirubin less than 2
Method of request (all routines):
1-Inpatients - 61933 to be done within 5 working days (ward to send request slip)
2-Outpatients - 61933 to be done within 10-15 working days (request slip brought in by patient)
3-ASAP - consultation with radiologist (resident on GI procedure during duty hours - off duty hours, resident on-call
Preparation:
1-Inpatients - 4 tablets Bilopaque 2200-2300 hours night before exam; no food or milk products after 1800 hours; n.p.o. after 2300 hours
2-Outpatients - 4 tablets x 2 successive evenings at 2200-2300 hours; no food or milk products after 1800 hours; n.p.o. after 2300 hours

Barium Swallow (Esophagram With or Without Video):
Availability: All hours as indicated.
Indications:
1-Routine - Dysphagia, odynophagia (nonspecific); signs/symptoms of

G-E reflux; rule out esophagitis, Barrett's ulcer, CA, hiatus hernia

2-Emergency - Rule out monilial or herpes esophagitis, obstruction, possible perforation or rupture (these exams done with gastrografin-contrast)

Method of request (all routines):

1-Inpatients - 61933 to be done within 5 working days (ward to send request slip)

2-Outpatients - 61933 to be done within 10-15 working days (request slip brought in by patient)

3-ASAP - consultation with radiologist (resident on GI procedure during duty hours - off duty hours, resident on-call)

Preparation: n.p.o. 2 - 4 hours prior to exam

UGI (Upper GI Series):

Availability: All hours as indicated.

Indications:

1-Routine - Epigastric or RUQ pain workups, F/U duodenal ulcer IF continued symptoms, F/U benign gastric ulcer, weight loss; rule out carcinoma lymphoma (including pancreas); workup of pancreatitis, jaundice; patient's pre-op for cholelithiasis; evaluation of abdominal mass; gastric outlet obstruction; post-op gastroduodenal surgery

2-Emergency - UGI bleed (only after consultation with GI Service); rule out perforation (this exam performed with gastrografin; only after consultation with General Surgery Service); possible acute duodenal obstruction

Method of request (all routines):

1-Inpatients - 61933 to be done within 5 working days (ward to send request slip)

2-Outpatients - 61933 to be done within 10-15 working days (request slip brought in by patient)

3-ASAP - consultation with radiologist (resident on GI procedure during duty - off duty hours, resident on-call)

BE (Barium Enema - Lower GI Exam):

Availability: All hours as indicated

Indications:

1-Routine - air contrast BE (double contrast BE-lower GI): guiaiac positive stools-unknown etiology; family history of colon CA or polyps; workup of polyposis syndrome; known polyp (procto-colonscopy) or history of polyp; post-op colon for carcinoma (at least once after patient's surgery); known inflammatory bowel disease or to rule out inflammatory bowel disease (IBD) (will not be done in patients having fulminating episode or if toxic megacolon present)

2-Standard BE (single contract BE) - workup of hemorrhoidal bleeding or pre-op for hemorrhoids; bright red rectal bleeding; colostomies, mucous fistula; evaluation of diverticular disease; rule out diverticulitis; constipation; staging of certain lower abdominal and pelvic carcinomas; evaluation of abdominal mass.

3-Emergency (single contrast only) - rule out obstruction (barium - colon or distal small bowel); acute lower GI bleed (barium - only after consultation with GI service); suspected perforation (other than diverticulitis - hypaque enema to be performed); ischemic bowel disease - barium to be used if no significant peritonitis and angiography not contemplated immediately.

Method of request (all routines):

1-Inpatients - 61933 to be done within 5 working days (ward to send request slip)

2-Outpatients - 61933 to be done within 10-15 working days (request slip brought in by patient)

3-ASAP - consultation with radiologist (resident on GI procedure during duty hours - off duty hours, resident on-call

Preparation (none for emergency studies): 2-3 days clear liquid diet; colon prep kit (from Radiology Dept or ward); n.p.o. after bedtime

SBFT (Soft Bowel Follow-Through - Small Bowel Series):

Availability: All hours as indicated

Indications: workup mid and lower abdominal pain; malabsorption syndrome; chornic diarrhea; polyposis syndrome; GI bleed - only when all other studies normal; abdominal masses; weight loss; cancer staging - as indicated; ileostomy evaluation; small bowel obstruction (SBO) - partial (barium to be used)

Method of request (all routines):

1-Inpatients - 61933 to be done within 5 working days (ward to send request slip)

2-Outpatients - 61933 to be done within 10-15 working days (request slip brought in by patient)

3-ASAP - consultation with radiologist (resident on GI procedure during duty hours - off duty hours, resident on-call)

Hypotonic Duodenogram:

Availability: Duty hours only

Indications: Upon recommendation by Radiology Department only

Method of request (all routines):

1-Inpatients - 61933 to be done within 5 working days (ward to send request slip)

2-Outpatients - 61933 to be done within 10-15 working days (request slip brought in by patient)

3-ASAP - consultation with radiologist (resident on GI procedures during duty hours - off duty hours, resident on-call)

Preparation: n.p.o. 2 - 4 hours prior to exam (including no smoking)

Double Contrast Small Bowel Study (Enteroclysis):

Availability: Duty hours, afternoon special procedures exam only

Indications: Upon recommendation by Radiology Department only

Method of request: 61933 for appointment

Preparation: n.p.o. 4 hours prior to study

PTC (Percutaneous Transhepatic Cholangiogram, "Skinny Needle" Chiba Needle Exam):

Availability: Routine duty hours only by arrangement through Gastroenterology

Indications: Biliary obstruction

Method of request: Gastroenterology must be consulted. They arrange time for exam by calling GI staff radiologist (61937)

Percutaneous T-Tube Biliary Stone Extraction:
Availability: Routine duty hours
Indications: Biliary obstruction
Method of request: Through consultation with GI staff radiologist
Preparation: Same as for PTC (Percutaneous Transhepatic Cholangiogram)

Hysterosalpingography:
Availability: Normal duty hours only
Indications: Infertility, other clinical indications
Method of request: Done in conjunction with OB/Gyn by appointment only; patient must submit slip in 1X to scheduling technician
Preparation: None; patient should have examination after completion of menses

Cranial CT:
Availability: 0730-2300 by appointment
Indications: Evaluation of intracranial structures and orbits
Method of request: 61943 - request slip to CT by appointment only
Preparation: n.p.o. 4 hours prior to scan

Body CT:
Availability: Duty hours
Indications: Determined by consultation with radiologist (61943)
Method of request: By appointment only (61943) - request to CT
Preparation: n.p.o. 4 hours prior to exam

Portable Exams: AP abdomen; AP and lateral cervical spine; chest AP, decubitus abdomen; lateral chest; extremities; AP and lateral skull; others by consultation only
Availability: All hours
Indications: Clinical inadvisability to move patient to Main Radiology for examination
Method of request: Telephone request (61491) for 4th floor; all other floors 61946 from 0745-1630 hours, other times 61945. If examination STAT and no answer at 61491, call 61956 during duty hours. Call information (61000) to locate technician if unable to get answer during nonduty hours.
Preparation: None

Sinograms:
Availability: Normal duty hours and by arrangement
Indications: Evaluation of draining sinuses
Method of request: Submission of SF 519A to scheduling desk; call 61933 to arrange for appointment. Telephone contact with on-duty physician (61939) evenings and weekends.
Preparation: None

Lymphangiogram:
Availability: Normal duty hours only
Indications: Staging of lymphomas and cervical carcinomas; other indications by consultation with radiologist
Method of request: By appointment only - slip to appointment desk
Preparation: Feet shaved and cleaned with antiseptic solution and wrapped in sterile towels one hour prior to procedure

Ultrasound (Sonogram) - Pelvis, Abdomen, Thyroid, Kidneys:
Availability: Duty hours
Indications: Evaluation of mass lesions, biliary obstruction, aneurysm, intrauterine pregnancy and other Gyn problems
Method of request: By appointment only - slip to appointment desk (61933)
Preparation: Abdomen - n.p.o. 12 hours prior to exam; pelvis - drink 4 glasses liquid 2 hours prior to exam; exam must be performed with full bladder

Tomograms:
Availability: Duty hours only
Indications: Consultation with radiologist
Method of request: By consultation with radiology staff and/or resident in consultation room (61939)
Preparation: None

Visceral Angiography:
Availability: All hours by arrangement
Indications: Evaluation of vascular and visceral disease in consultation with radiologist
Method of request: By appointment only (62581)
Preparation: Clear liquids 12 hours prior to study; premeds as ordered by consulting physician

Cerebral Angiogram:
Availability: All hours by arrangement
Indications: Determined by neurological evaluation or consultation with radiologist
Method of request: By appointment only (62581) - request slips on chart
Preparation: Clear liquids 12 hours prior to study; premeds as ordered by consulting physician

Myelogram:
Availability: Normal duty hours; off duty hours by arrangement
Indications: To be determined by neuroradiological evaluation
Method of request: Through clinical evaluation of Dept of Neurosurgery
Preparation: n.p.o., premedication is ordered by consulting physician

Cardiac Catheterization:
Availability: Normal duty hours or by arrangement with Cardiology only. Cardiologist on-call after normal duty hours.
Indications: Clinical evidence of congenital or acquired heart disease
Method of request: Consultation to Cardiology Clinic or by calling 61491 or 62581. For emergent care during nonduty hours, contact cardiologist on-call.
Preparation: n.p.o. from evening before or from time of consultation if emergent

Renal Cyst Puncture:
Availability: Normal duty hours
Indications: Confirmation of benign renal cyst; consultation with radiologist in charge of Ultrasound
Method of request: Through consultation with radiologist
Preparation: Clear liquids 4 hours prior to procedure

Venograms:
Availability: Normal duty hours
Indications: Evaluation of deep vein thrombosis
Method of request: By appointment only (61939) - ask for resident responsible for venograms
Preparation: Clear liquids 4 hours prior to procedure

Arthrograms:
Availability: Normal duty hours only
Indications: To evaluate suspected meniscal or cartilaginous injury; to evaluate for Baker's cyst; to look for loose body in joint
Method of request: By appointment only - request to scheduling desk
Preparation: None

Pulmonary Angiography:
Availability: Normal duty hours or by arrangement with Cardiology only. Cardiologist on-call after normal duty hours
Indications: Equivocal pulmonary isotopic scan or clinical evidence of pulmonary vascular abnormality
Method of request: Consultation to Cardiology Clinic or by calling 61491 or 62581; nonduty hours by calling cardiologist on-call
Preparation: n.p.o. from evening before or from time of request if emergent

Laryngograms:
Availability: Normal duty hours
Indications: Evaluation of laryngeal neoplasm or dysfunction not fully explained by laryngeal tomograms
Method of request: By appointment only; request to schedule desk after consultation with radiologist
Preparation: n.p.o. 4 hours prior to procedure

Bronchograms:
Availability: Normal duty hours
Indications: Consultation with radiologist
Method of request: By appointment only
Preparation: n.p.o. 12 hours prior to study; premeds as ordered by consulting physician

Excretory Urogram with Tomography:
Availability: By appointment only
Indications: Evaluation of renal outlines or collecting systems to exclude suspected mass
Method of request: SF 519A to appointment desk with patient
Preparation: Omit meal prior to exam

Excretory Urogram (XU or IVP): NOTE: This study performed both in Urology and Radiology
Availability: Duty hours by appointment only
Indications: Suspected calculus, mass, anomaly, pre-op, trauma, hematuria, etc. NOTE: Bladder NOT evaluated unless "XC" ordered as well

Method of request:
Urology: SF 513 and SSF 519 (completed filled out) to reception desk, Urology, 4th Floor, 61406/61407
Radiology: SF 519A to appointment desk with patient (61933)
Preparation: Omit meal prior to exam

Other Urologic Studies Available:

XC — Excretory cystogram (commonly ordered with XU)
RC — Retrograde cystogram
RUG — Voiding cystourethrogram

NOTE: Pediatric Radiologist available for consultation regarding studies in this age group (61937). All GU studies on pediatric patients will be performed in the Department of Radiology.

Other Fluoroscopy:
Availability: All hours by arrangement
Indications: Tube placement, physiologic evaluation of diaphragm, joint motion, lung or mediastinal abnormality, other
Method of request: Telephone approval by staff or residents in Consultation Room (61939) or duty radiologist during nonduty hours
Preparation: None

Thyroid Scan:
Availability: Normal duty hours
Indications: Evaluation of thyroid size, shape and position. Evaluation of thyroid nodules
Method of request: By appointment only (61186); request slip SF 519A and chart to appointment desk with patient
Preparation: No thyroid medication or thyroid suppressive drug 4 weeks before study, or x-ray contrast study

Vascular Flow Study:
Availability: Normal duty hours only
Indications: To evaluate any vascular lesion, vascular obstruction, collateral vessels, aneurysm, vascularity of tissue or organ
Method of request: By appointment only (61186); request slip SF 519A and chart to appointment desk with patient
Preparation: None

Sialogram:
Availability: Normal duty hours
Indications: Evaluation of salivary gland calculi, neoplasm or inflammatory diseases
Method of request: Through consultation with Oral Surgery Dept, 61923
Preparation: Per Oral Surgery Dept

Velopharyngography:
Availability: By arrangement only
Indications: In conjunction with Plastic Surgery Speech Impediment

Velopharyngography (continued:
Method of request: Scheduling through appointment desk (61933). Speech personnel must be available with video cassette
Preparation: None

ERCP:
Availability: Routine duty hours and by arrangement through Gastroenterology only
Indications: Jaundice, chronic pancreatitis, other clinical diseases
Method of request: Gastroenterology must be consulted. They arrange fluoroscopy by calling 61993 and presenting slip to appointment desk.
Preparation: n.p.o.; medications as determined by Gastroenterology

Pediatric Examinations:
Availability: All hours (by arrangement for nonduty hours)
Indications: Consistent with patient care
Method of request: Presentation of patient with appropriate SF 519A identifying patient as being a pediatric patient. This is especially necessary for adolescents, as the pediatric age group is arbitrarily terminated at age 16.
Special examinations: By arrangement with the pediatric radiologist (61939) and by calling 61945 during nonduty hours to reach pediatric radiologist
Preparation: For almost all plain films, no preparation is necessary. Barium and/or soluble contrast studies present varying degrees of preparation, and it is suggested you refer to:
- Pediatric radiology manual
- Radiology resident
- Pediatric radiologist

This referral for the most part refers to nonduty hours. Again, preparation varies according to the study and the clinical picture. Questions regarding preparation should be referred to the pediatric radiologist for clarification.

Xerography:
Availability: Mammography - normal duty hours by appointment only. All other xerograms by consultation with radiologist. Plain films must be available.
Indications: Screening for carcinoma. Foreign bodies and some soft tissue evaluations.
Method of request: Scheduling by patient with SF 519A in Radiology, or by phone from outlying clinic. If patient is under 35 years of age, examination must be cleared by radiologist (61939).
Preparation: None

Metastatic Bone Survey
Availability: Normal duty hours
Indications: Evaluation of metastatic disease to bone
Method of request: Through consultation with radiologist after obtaining results of bone scan
Preparation: None

Panorex, Dental X-rays:

Availability: Normal duty hours
Indications: Dental Pathology with facial trauma
Method of request: Request to Oral Diagnosis, 61041 or call 61805
Preparation: None

NUCLEAR MEDICINE IMAGING PROCEDURES

The AVAILABILITY and METHOD OF REQUEST for the following procedures are the same unless otherwise indicated:

Availability: Normal duty hours only
Method of request: By appointment only (65140); request slip DA 4700 should be sent immediately to Nuclear Medicine. Patient should bring records/chart to the appointment.

BONE SCAN

Indications: To detect and characterize the extent of primary or secondary bone disease, trauma, infarction
Preparation: None

BONE MARROW SCAN

Indications: To evaluate bone marrow function, anemia, viability of femoral head following trauma or therapy
Preparation: None

CARDIAC BLOOD POOL STUDY (MUGA)

Indications: Evaluation of wall motion, ejection fraction, detection of infarct, coronary artery disease, cardiomypathy, etc.
Method of request:
For rest study: by appointment only (65140)
For exercise study: by appointment only through Cardiology Clinic (61412)
Preparation:
Rest study: None
Exercise study: Pickup patient explanation sheet

CEREBROSPINAL FLUID SHUNT EVALUATION

Indications: Assessment of cerebrospinal fluid shunt function
Preparation: Radiopharmaceutical must be injected into the shunt reservoir by neurosurgeon at the time of exam

CISTERNOGRAM

Indications: To evaluate cerebrospinal fluid flow in diagnosis of hydrocephalus, CSF rhinorrhea and CSF otorrhea. For CSF leakage study, consult ENT for placement of nasal/auricular pledgets.
Preparation: The radiopharmaceutical will be delivered to the ward for intrathecal administration by attending physician

RETROGRADE CYSTOGRAM

Indications: Detection of vesicoureteral reflux
Preparation: None

RADIODACRYOCYSTOGRAM

Indications: Evaluation of lacrimal drainage apparatus
Preparation: None

GALLIUM SCAN

Indications: Detection of tumor or inflammation. An Indium-WBC study may be added by the Nuclear Medicine physician for inflammation if clinically indicated
Preparation: None

HEPATOBILIARY SCAN

Availability: For emergencies after normal duty hours, contact Radiology resident on-call physician (61945/61939)
Indications: Assessment of hepatobiliary function, diagnosis of acute cholecystitis, evaluation of gall bladder dysfunction, differentiation of hepatocellular disease from extrahepatic obstructive jaundice
Preparations: n.p.o. for 2 (preferably 10) hours prior to examination

KIDNEY SCAN

Availability: For emergencies after normal duty hours, contact the Radiology resident on-call physician (61945/61939)
Indications: Evaluation of renal function, blood flow, space occupying lesions, trauma, obstructive uropathy
Preparations: None

LIVER SPLEEN SCAN

Availability: For emergencies after normal duty hours, contact the Radiology resident on-call physician (61945/61939)
Indications: To evaluate the size, shape, position and function of liver and spleen. To demonstrate space occupying lesions, accessory splenic tissue. Evaluation of suspected hepatic oir splenic trauma.
Preparations: None

LUNG SCAN (VENTILATION/PERFUSION)

Availability: For emergencies after normal duty hours, contact the Radiology resident on-call physician (61945/61939)
Indications: Diagnosis and management of pulmonary embolism; evaluation of regional function in chronic obstructive pulmonary disease and in lung cancer
Preparations: A current (same day) chest x-ray should be available. Stable clinical condition required. Physician may be requested to accompany patient and stay in attendance during the study.

MECKEL'S DIVERTICULUM SCAN

Indications: To demonstrate Meckel's diverticulum; other bleeding bowel diseases
Preparation: n.p.o. after midnight; no recent barium studies

MYOCARDIAL INFARCTION SCAN (99m TcPYP)

Indications: Detection of recent myocardial infarction. Maximum sensitivity if from 2 to 4 days post-MI.
Preparations: None

MYOCARDIAL PERFUSION SCAN (201 Thallium)

Indications: Detection of ischemia and/or infarction
Method of request:
For rest study, by appointment only (65140)
For exercise study, by appointment through Cardiology (61412)
Preparations: None

NECK AND CHEST SCAN (I 131)

Indications: To evaluate extent of thyroid carcinoma (particularly papillary and follicular), and residual thyroid carcinoma after thyroidectomy
Preparations: Consult with Nuclear Medicine physician

SALIVARY GLAND SCAN

Indications: Evaluation of salivary gland function and mass lesions
Preparations: None

TESTICULAR SCAN

Availability: For emergencies, contact the Radiology resident on-call physician (61945/61939)
Indications: To differentiate acute epididymo-orchitis from acute torsion
Preparations: None

SHUNTOGRAM (CARDIAC)

Indications: Detection and quantification of left-to-right shunt
Preparations: None

INDIUM 111 WBC

Indications: Inflammation (abscess)
Preparations: 90cc of blood will be drawn in radiopharmacy on day of test. If patient is critical, physician may draw blood on ward. To have the study, patient must sign informed consent.

PERCHLORATE DISCHARGE

Indications: Diagnosis of thyroid organification defect
Preparations: Call Nuclear Medicine physician

ADRENAL SCAN

Indications: Evaluation of Cushings' syndrome or hyperaldosteronism
Preparation: Call Nuclear Medicine physician

ESOPHAGEAL REFLUX

Indications: Evaluation of esophageal reflux
Preparations: None

FLUORESCENT SCAN

Indications: Iodine content of thyroid
Preparations: None

MILK ASPIRATION

Indications: Evaluation of recurrent pneumonia caused by aspiration of milk in neonate
Preparations: n.p.o. 2 hours prior to appointment

GASTRIC EMPTYING

Indications: Evaluation of gastric motility and emptying disorders
Preparations: n.p.o. after midnight

JOINT SCAN

Indications: Evaluation of distribution of joint involved with arthritis
Preparations: None

LEVINE SHUNT STUDY

Indications: Evaluation of the patency of a Levine shunt
Preparations: None

HEPATIC ARTERY INFUSION STUDY

Indications: Evaluation of catheter placement prior to chemotherapy infusion to the liver
Preparations: None

THYROID SCAN

Indications: Evaluation of thyroid size, shape and position. Evaluation of thyroid nodules.
Preparations: None

BRAIN SCAN

Indications: Detection of brain tumors (primary or secondary), abscess, arteriovenous malformation, subdureal hematomas, infarcts
Preparations: None

NUCLEAR MEDICINE SERVICE PORTABLE EXAMINATIONS

WARDS WHICH ARE SERVICED WITH PORTABLE EXAMINATIONS: Portable studies are offered on the 4th floor in the various intensive care units (Wards 40, 42, 45, 46 and 49); and the operating room.

REQUEST FOR EXAMINATION: To request a portable Nuclear Medicine study, call the Nuclear Medicine physician at 65140. Upon approval, the Nuclear Medicine consult form, DA 4700, should be delivered to the Nuclear Medicine physician. It should indicate the reason for the study and specific question to be answered. If requesting a gallium, In-WBC, or bone scan, a specific area must be indicated for imaging.

SCHEDULING OF PORTABLE EXAMINATION: The portable service is offered only during normal duty hours, Monday though Friday, 0730-1630. Studies will be scheduled on a first come basis and on availability of the radioisotope and scanning time. If the clinician seeks to have a portable study on a more urgent basis and the desired time slot is not available, then the Nuclear Medicine physician will aid the two clinicians in resolving the priority of patients.

PORTABLE EXAMINATIONS OFFERED:

Rest Muga
Infarct Scan
Rest Thallium (radiopharmaceutical must be ordered in advance)
Spleen (heat damaged RBC)
Liver Spleen Scan
Hepatobiliary-GI Bleed study (all efforts should be made to perform in Nuclear Medicine Clinic because better images are obtained there)
Renal Scan
Brain Scan
SCV Venography
IVC Venography (no lower extremity venography)
MAAAP
Meckel's
Limited Bone Scan
Cardiac Shunt Evaluation
Perfusion Lung/Aerosol Ventilation
Cisternogram (radiopharmaceutical must be ordered in advance)
Gallium (limited) (all efforts should be made to perform in Nuclear Medicine Clinic because better images are obtained there)
White Cell Infection Scan (all efforts should be made to perform in Nuclear Medicine Clinic because better images are obtained there)
Testicular Scan

PATIENT PREPARATION AND BLOOD SAMPLE HANDLING

PROSTATIC ACID PHOSPHATASE (PAP):

Blood samples for PAP are to be drawn in a 7.0 ml red top tube. The tube and accompanying request slip should be labeled with the patient's name, identifying number, type of test, date and time drawn and ward number or clinic name. Samples must arrive in the Nuclear Medicine Clinic within 24 hours of obtaining the specimen. The assay is performed once a week on Mondays with results available the following Tuesday afternoon. Samples received after 0800 hours on Monday, will be frozen until the following assay is performed.

NORMALS: Less than 2.7 ng/ml for males greater than 40 years of age

RENIN ASSAYS:

Blood samples for Renin activity are to be drawn in a chilled 7.0 ml purple top tube (pre-chill in a 4°C ice bath). The tube has to be kept at 4°C at all times and brought to our clinic within 30 minutes after drawing. Results of a 24 hour urine sodium and total volume, collected as close as possible to the time of blood sampling, should be available to our laboratory since the results of the Renin activity are compared to the 24 hour urine sodium and total volume. The tube and request slip should supply the following information: patient's name, date and time drawn, identifying number, type of test request, medications and whether the patient was supine or erect when the sample was drawn. The assay is performed every Thesday at 0800 hours with the results available on the following Thursday.

NORMALS: Expressed in nanograms per ml per hour and are compared with the 24 hour urine sodium total volume

T3RU (Tri-Iodothyronine Resin Uptake):

Blood samples for T3RU are to be drawn in a 7 ml red top tube (pediatric samples should contain no less than 1.0 ml of clotted blood). The tube and request slip should contain the following information: patient's name, identifying number, date and time drawn, type of test and medications. The sample should be brought to our clinic within 24 hours after the specimen has been obtained. The assay is run every day except Fridays and results from samples received in our laboratory before 1100 hours will be available at 1600 hours on the same day. Samples received after 1100 hours will be frozen until the following assay is performed.

NORMALS: 35.2 - 45.8%

T3 by RIA:

Samples for T3 RIA are to be drawn in a 7 ml red top tube (pediatric samples should contain no less than 1 ml of clotted blood), and should be delivered to our laboratory within 24 hours of obtaining the specimen. The tube and lab slip should contain the following information: patient's name, identifying number, date and time drawn, type of test and medications. The assay is run

every Thursday at 0800 with results reported out on the following Friday. Samples received after 0800 hours on Thursday will be frozen until the following assay is performed.

NORMALS: 115 - 220 ng%

T4 by RIA (Tetraiodothyroxine):

Blood samples for T4 RIA are to be drawn in a 7 ml red top tube (pediatric samples should contain no less than 1 ml of clotted blood), and should be delivered to our laboratory within 24 hours of obtaining the specimen. The tube and lab slip should contain the following information: patient's name, identifying number, date and time drawn, type of test and medications. The assay is run every day except Friday. Results from samples received by 1100 hours will be available at 1600 hours on the same day. Samples received after 1100 hours will be frozen until the following assay is performed.

NORMALS: 6.06 - 12.31 micrograms %

HTSH by RIA (Human Thyroid Stimulating Hormone):

Blood samples for HTSH RIA are to be drawn in a 7.0 ml red top tube (pediatric samples should contain no less than 1.0 ml of clotted blood) and should be delivered to our laboratory within 24 hours after specimen has been drawn. The tube and lab slip should reflect the following information: patient's name, identifying number, type of test, date and time drawn, and medications. The assay is run every Monday at 0800 hours. Samples received after this time will be processed for the following run. Results from the Monday run will be available by the following Tuesday at 1600 hours.

NORMALS: Less than 5.0 uIU/ml

B-HCG by RIA, QUANTITATIVE (Beta-Human Chorionic Gonadotropin):

Blood samples for B-HCG RIA are to be drawn in a 7.0 ml red top tube and should be delivered to our laboratory within 24 hours after the specimen has been drawn. The tube and lab slip should reflect the following information: patient's name, identifying number, date and time drawn, type of test requested, medications, and a brief history of the patient. We are currently doing B-HCG by RIA to rule out ectopic pregnancy. We are not doing routine B-HCG. The assay is run every dat at 1100 hours. Samples received after this time will be processed for the following run. Results are available by 1600 hours the dame day (we emphasize that this is a "courtesy" service offered to improve the present "turnaround time" of results from the routine lab). We will not perform emergency assays on specimens received after 1100 hours. All samples for B-HCG for ectopic pregnancy must go through Ward 67 (OB/Gyn Clinic).

NORMALS: Less than 5.0 mIU/ml for non-pregnant females

SCHILLING'S TEST:

Patient preparation: n.p.o. after midnight. Prior to test, B-12 blood levels must be drawn. Notify the Nuclear Medicine receptionist to obtain special instructions and scheduling. Return the 24 hour urine collection to the Nuclear Medicine Clinic.

TOTAL BLOOD VOLUME:

Patient preparation: need most recent height and weight. Notify the Nuclear Medicine receptionist to obtain special instruction and scheduling.

LH by RIA (Luteinizing Hormone):

Blood samples for LH are to be drawn in a 7.0 ml red top tube and sent to the Nuclear Medicine Service within 24 hours after collection. The tube of blood and lab request slip should reflect the following information: patient's name, identifying number, date and time drawn, type of test requested and recent medications. The LH assay is performed once a week beginning on Thursday at 0800 hours with results available the following day. Samples received after 0800 hours on Thursday will be frozen until the following assay is performed.

NORMALS:	Males:	2.6 - 16.7 mIU/ml	
	Females:	Follicular phase:	3.4 - 15.4 mIU/ml
		Luteal phase:	3.4 - 15.4 mIU/ml
		Midcycle:	50.0 - 150.0 mIU/ml
		Post-menopause:	26.4 - 148.5 mIU/ml

PROLACTIN by RIA:

Blood samples for prolactin are to be drawn in a 7 ml top tube and sent to the Nuclear Medicine Service within 1 hour after collection. The tube of blood and lap slip should reflect the following information: patient's name, identifying number, date and time drawn, type of test and recent medications. The prolactin assay is performed once a week, beginning on Wednesday at 0800 hours with the results available on Thursday afternoons. Samples received after 0800 hours on Wednesday will be frozen until the following assay is performed.

NORMALS: 1.3 - 15.6 ng/ml

FSH by RIA (Follicle Stimulating Hormone):

Blood samples for FSH are to be drawn in a 7 ml red top tube and sent to the Nuclear Medicine Service within 1 hour after collection. The tube of blood and lab slip should reflect the following information: patient's name, identifying number, date and time drawn, type of test and recent medications. The FSH assay is performed once a week beginning on Wednesday at 0800 hours with results available on Thursday afternoons. Samples received after 0800

hours Wednesday will be frozen until the following assay is performed.

NORMALS:	Males:	3.0 - 18.8 mIU/ml	
	Females:	Follicular phase:	2.6 - 12.7 mIU/ml
		Luteal phase:	2.6 - 12.7 mIU/ml
		Midcycle	12 - 30 mIU/ml
		Post-menopause	48.4 - 190.6 mIU/ml

NEONATAL T4 and NEONATAL TSH:

Contact the Nuclear Medicine Service for information.

NORMALS:	Neonatal T4	2 day old:	6.8 - 16.1 ug%
		3 day old:	7.6 - 17.2 ug%
	Neonatal TSH	3 day old:	1.0 - 17.0 uIU/ml

RED CELL SURVIVAL, FERROKINETICS AND FECAL BLOOD LOSS:

Please notify the Nuclear Medicine Service to obtain special instructions and scheduling for the above procedures.

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